engineer. HCC documentation supporting the independent registered professional engineer's certification will be furnished to the Director upon request. The engineer will make routine inspections at the facility during closure activities to support the certification.

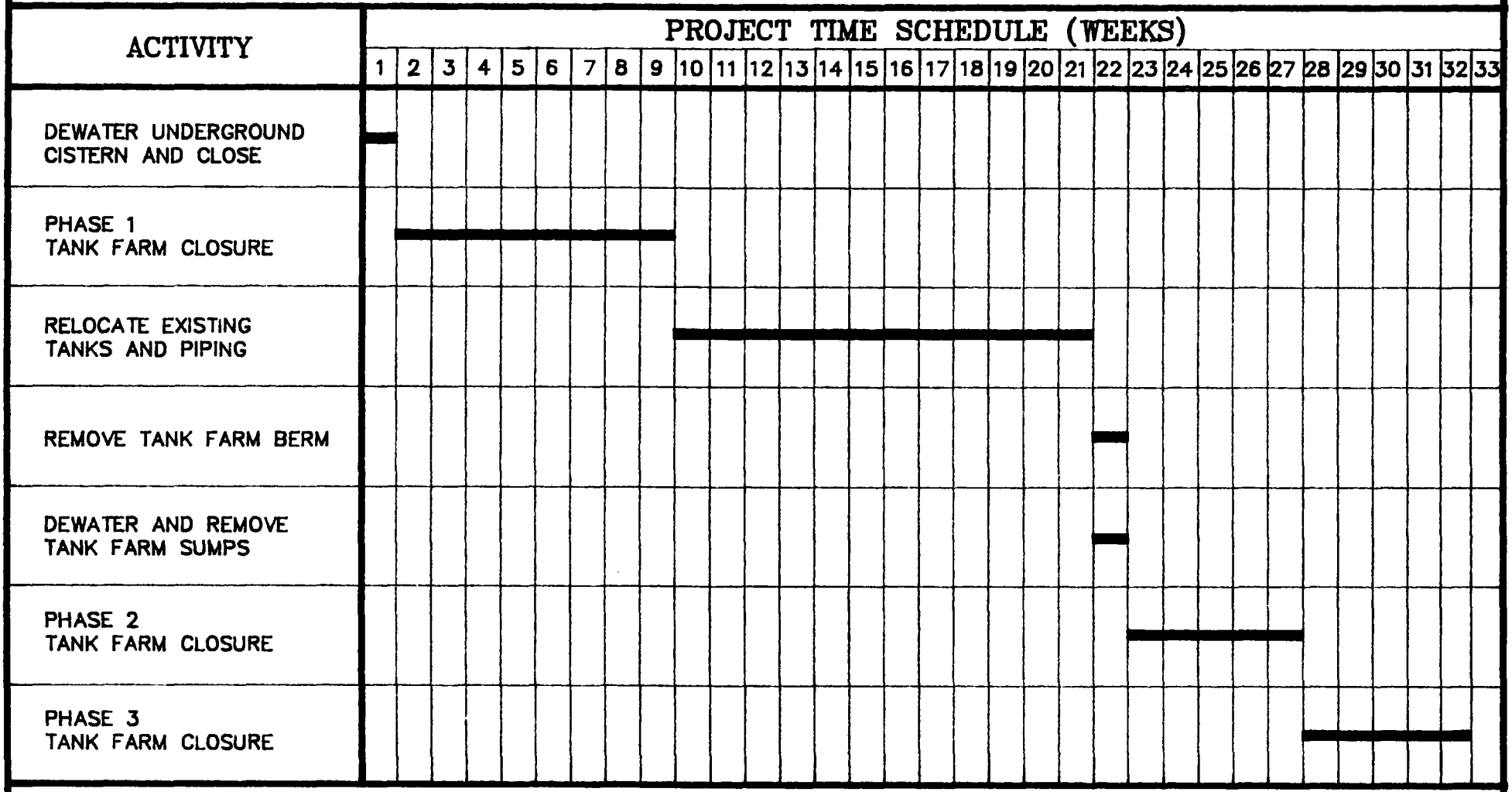
Closure Schedule

Figure 10 presents the closure schedule for the tank farm and underground cistern. All closure activities can be completed in 180 days, weather permitting, upon final approval from the OEPA director. However, relocating the hazardous materials storage tanks, piping and ancillary equipment will create a lag between Phases 1 and 2 that will extend the project completion time beyond 180 days. The work should be completed in late 1990. If an extension is needed, HCC will submit a formal request to the OEPA under provisions stated in OAC 3745-66-13.

CLOSURE SCHEDULE

HUKILL CHEMICAL CORPORATION

BEDFORD, OHIO



NOTE– Each Tank Farm Closure Phase Includes Excavating Gravel, Laying Drainage Pipe, Preparing Base, Installing Concrete Cap, Trenches, Berms And Grating.

SK495–1H

FIGURE 10

IV. POST-CLOSURE CARE

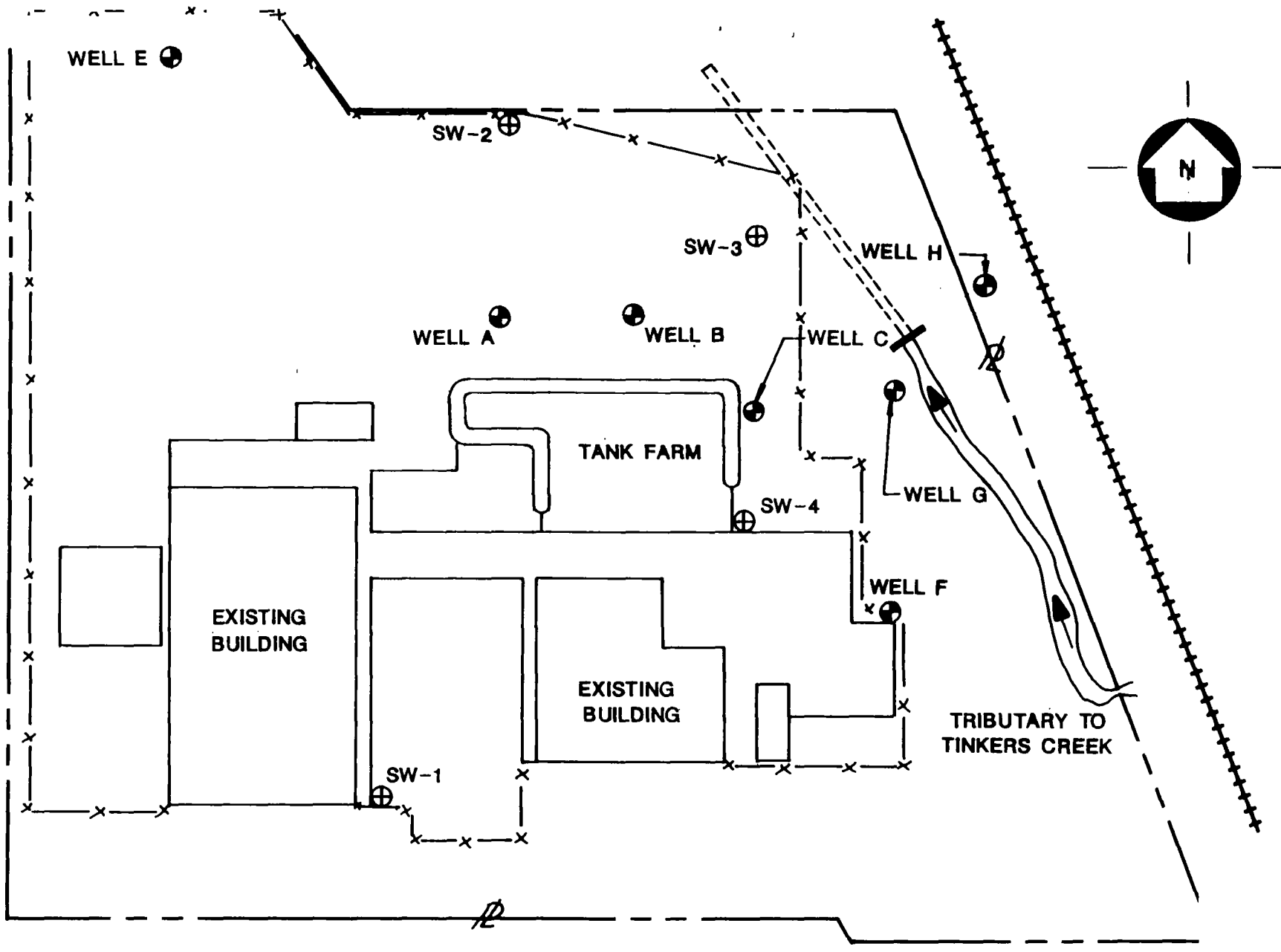
Groundwater Monitoring

HCC has a groundwater monitoring system which consists of ten monitoring wells in downgradient locations relative to the site. An upgradient monitoring well, SW-1 provides background monitoring data. The present number and placement of monitoring wells is sufficient for post-closure monitoring of the solvent tank farm and cistern because each unit has three or more downgradient monitoring wells in the uppermost aquifer and because background well, SW-1 is upgradient of both units and is far enough away to preclude it being contaminated by either unit.

Figure 11 shows all groundwater monitoring well locations. The monitoring wells that will be sampled during post-closure care include SW-1, SW-2, SW-3, SW-4, F and G. The SW-1 well will represent upgradient groundwater quality entering the site. The other wells will monitor the extent of VOC contamination previously identified during the site investigation. All wells will be sampled twice per year and analyzed for VOC (USEPA test method 8240) compounds previously identified in groundwater at the site. The sampling protocols will follow those specified in EA's Quality Assurance Program Plan implemented during the 1986 and 1988 site investigation.

Soil Sampling

Soil characteristics were documented as part of EA's previous site investigations. Since the contaminated soil will remain in place following closure and the concrete cap will minimize the potential for contaminant migration by preventing infiltration, continued soil monitoring activities are not proposed. The cap should also eliminate the presence and generation of perched water in the tank farm area, thereby reducing containment migration.



⊕ MONITORING WELL (INSTALLED IN 1986 AND 1988)

⊕ MONITORING WELL (INSTALLED IN 1982).

WELL LOCATIONS

SCALE 1"= 100'

FIGURE 11

eder associates consulting engineers, p.c.

Leachate Monitoring

The drainage structures to be installed beneath the concrete cap in the tank farm area may collect perched water in the area. The perched water collected in the drainage sumps will be pumped to an available storage tank and analyzed for VOCs on an as needed basis. It is difficult to estimate the quantity that will be collected, but generation rates should decrease over time since the source (surface infiltration) will be eliminated by the concrete cap.

This perched water, if contaminated, will either be processed on-site or transported by tanker truck off-site to a permitted TSD facility. HCC will be responsible for maintaining a record of the quantity of perched water collected, all analytical results and the disposition.

Sampling and analysis of the perched water collected around the underground cistern will be detailed in the correction action plan, which is currently being prepared pursuant to the USEPA CAFO.

Inspections and Maintenance

HCC will be responsible for conducting post-closure inspections. The routine inspections will include checking the integrity of the cap in the tank farm semi-annually and monitoring for accumulated liquids in the drainage and trench sumps daily while the plant is in operation. Any repairs to the cap will be made immediately.

The groundwater monitoring wells will be inspected semi-annually by HCC for physical damage and repaired accordingly. The security system (fence, warning signs and gates) will be checked monthly for physical damage, and repaired accordingly.

The frequency of monitoring and maintenance activities may be altered if the use of the cap following closure changes. HCC reserves the right to modify this schedule, as well as any parts of the closure

or post-closure plan, under provisions of OAC 3745-66-12(C) and 3745-66-18(D).

Post-Closure Notices

No later than sixty days after certification of closure of each hazardous waste management unit, HCC will submit to the local zoning authority, and to the OEPA director, a record of the type, location, and quantity of hazardous contaminated solid within each management unit.

Within sixty days of certification of closure of the cistern and within sixty days of certification of closure of the tank farm, HCC will:

(1) Record, in accordance with state law, a notation on the deed to the facility property, or on some other instrument which is normally examined during title search, that will in perpetuity notify a potential purchaser of the property that:

(a) The land has been used to manage hazardous wastes;

(b) Its use is restricted under OAC 3745-66-10 to 3745-66-20; and

(c) The survey plat and record of the type, location and quantity of hazardous waste within each unit required by this rule and OAC 3745-66-16 have been filed with the local zoning authority and with the OEPA director.

(2) Submit a certification, signed by HCC, that they have recorded the notation specified above including a copy of the document in which the notation has been placed, to the OEPA director.

If HCC or any subsequent owner or operator of the land upon which a hazardous waste unit is located wishes to remove the contaminated solid, a request to modify the post closure plan must be made in accordance with applicable requirements in the OAC.

Post-Closure Care Certification

Pursuant to OAC 3745-66-20 and 3745-50-42, no later than sixty days after completion of the established post-closure care period, HCC will submit to the OEPA director, by registered mail, a certification that the post-closure care period for the hazardous waste management unit was performed in accordance with the specifications in the approved post-closure plan. The certification will be signed by the owner or operator and in independent registered professional engineer. Documentation supporting the independent registered professional engineer's certification will be furnished to the OEPA Director upon request.

V. COST ESTIMATES

The closure and post-closure care cost estimates are presented in Tables 2 and 3, respectively. The estimated closure cost is $304,000 and the estimated post-closure care cost is $198,000.

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BEDFORD, OHIO

TABLE 2

CLOSURE COST ESTIMATE

	Item	Cost Estimate[a]
1.	Sub-base Preparation Excavate 450 yd^3 gravel	$1,000
2.	Gravel Base Fill Spread & Compact 23,000 ft^2	6,000
3.	Drainage Piping & Filter Fabric 400 feet 4"-diameter PVC 1500 ft^2 Geotech Fabric	2,000
4.	Concrete Cap 1,000 yd^3 1'-2" Slab Reinforced, 4,000 psi	250,000
5.	Trench Grating 1,000 ft^2 Standard Steel 3#/ft^2	5,000
6.	Underground Cistern Dewater, Backfill W/Sand & Concrete Cap	1,000
7.	Sampling and Laboratory Analyses	4,000
8.	Engineering Supervision and Certification	7,000 (b)
9.	SUBTOTAL	$276,000
10.	Contingency & Administration @ 10%	28,000
11.	TOTAL	$304,000

NOTES:

(a) Includes labor and equipment.
(b) Includes labor, travel and expenses for three separate trips (each phase).

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 3

POST-CLOSURE CARE COST ESTIMATE[a]

Item	Cost Estimate[a]
1. Groundwater Sampling and Analysis	
Sampling by HCC Personnel	$ 30,000
Analysis by Contract Laboratory	120,000
2. Inspections	
Cap, Security System & Monitoring Wells by HCC	15,000
3. Cap Maintenance	15,000
4. SUBTOTAL	$180,000
5. Contingency & Administration @ 10%	18,000
6. TOTAL	$198,000

Note:

(a) Cost estimate for 30 years, present worth.

APPENDIX A*

HYDROGEOLOGY

Ref: "Site Investigation Report, Revision Number 1", Eder Associates, January 1989

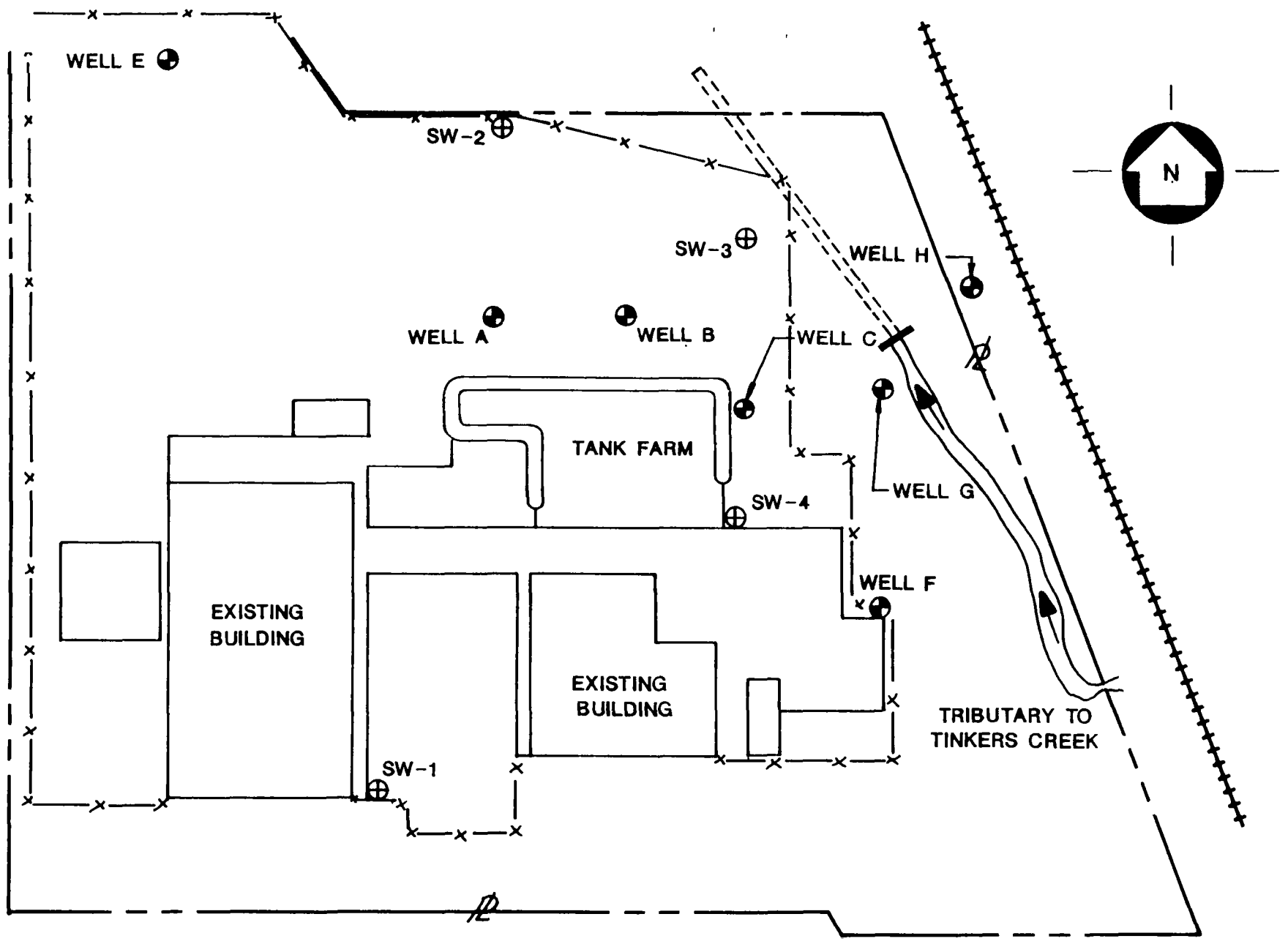
*Note: Appendices referenced in this Appendix are those found in the above referenced report and not included in this Closure Plan.

3.0 HYDROGEOLOGICAL CONDITIONS

Investigations conducted during April/May 1986, September/October 1986 and April 1988 included test borings and monitor well installations to define soil, subsoil, shallow geologic and groundwater conditions at the HCC site. A total of 63 soil borings plus seven monitor wells were installed during this period. Currently, there are a total of 11 monitor wells on site as shown on Figure 1. All monitor well and soil boring logs are presented in Appendix B. Four hydrogeological cross sections, designated as sections A-A', B-B', C-C' and D-D', are presented at the end of this section (Figures 5 through 9).

Most of the site is underlain by fill material ranging in thickness from one ft. to over 25 ft., and consisting of silty-sandy clay loam except in the "Chem-Pack" and Northwest fill areas where other types of fill are present as described in preceeding sections of this report. Underlying fill material is glacial till deposited during the Illinoisan stage of glacial advancement. It is a silty clay till which varies in thickness at the site. In some areas, the fill material overlies the shale bedrock (Meadville Shale). Grain size analysis tests performed on samples of the fill, till, and shale by Triggs and Associates, Inc. are presented in Appendix B.

A fractured and weathered zone characterizes the upper 25 ft. of shale. Numerous fractures are present which allow the circulation of shallow groundwater. Beneath this zone, the shale is more consolidated, less permeable and acts as a confining layer. This Meadville shale, which is the consolidated bedrock under the site, consists of alternating thin sandstone beds. It is medium to dark gray, fissile and arenaceous. The sandstone layers range in thickness from 1 to 10 inches. The Meadville shale has an average thickness of 75 feet, but varies from 35 feet to 90 feet south and west of the site (information obtained from records of well logs in Bedford Township). The Meadville shale is underlain by the Sharpsville sandstone which has



⊕ MONITORING WELL (INSTALLED IN 1986 AND 1988)

⊕ MONITORING WELL (INSTALLED IN 1982).

WELL LOCATIONS

.. SCALE 1"= 100'

eder associates consulting engineers, p.c.

FIGURE 1

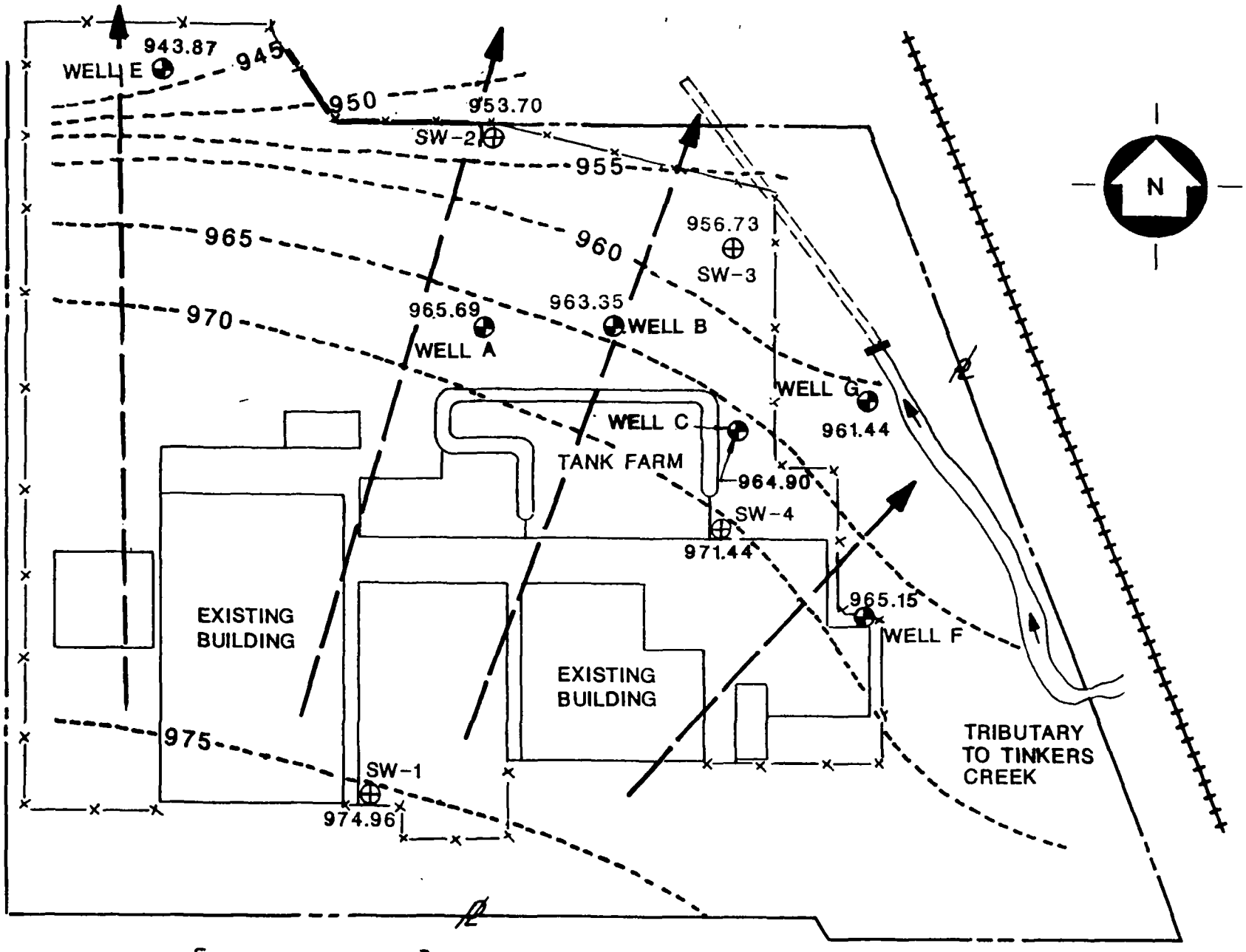
an average thickness of 45 feet. It consists of interbedded shales and sandstones. The sandstone layers are generally 1 to 14 inches thick and consist of hard, limy, gray-brown, fine grained calcareous beds. The interbedded blue shale is weak and fissile.

A small gulley borders the norther and eastern edges of the site where the surface topography drops sharply into a small intermittent tributary of Deerlick Run, Tinkers Creeek, the Cuyahoda River and, ultimately, Lake Erie. Unconsolidated glacial deposits pinch out in this gulley, which contains alluvial deposits consisting of interbedded silty clays, sandy clays and laminated silts with interbedded layers of organic clays and silts. These sediments lie directly on the shale bedrock which outcrops along the creek.

The shallow groundwater flow maps presented on Figures 2 and 3 were prepared using water level elevations of October 1986 and April 1988. Groundwater flow is shown schematically on Figure 4. Water level elevations are presented in Table 1.

The groundwater system has been identified at the site. Groundwater is confined in the weathered shale zone which is overlain by relatively impermeable silty clay fill and glacial till deposits and underlain by unweathered shale. Water levels in wells in the weathered shall stabilized an average of 10 ft. higher than the saturated zone tapped by the wells. The saturated weathered shale zone is underlain by gray shale which forms the lower confining layer.

A deep well was planned for the evaluation of the potential for vertical migration of contaminants into the shale bedrock. The deep well was drilled to a depth of 44 ft. and casing was installed to 34 ft. and the bottom of 10 ft. remained open. No groundwater was detected in the shale below the saturated fractured and weathered zone. The test well was left open to determine if any water would be produced, but, after one week, the test well remained dry. Based on this data, the shale underlying the site is relatively impermeable with little or no interconnection between fractures. Consequently,



LEGEND

- MONITORING WELL (INSTALLED 1986)
- MONITORING WELL (INSTALLED 1982)

[ELEVATIONS IN FEET]

(OCTOBER 1986)

GROUNDWATER FLOW PATTERN

FIGURE 2

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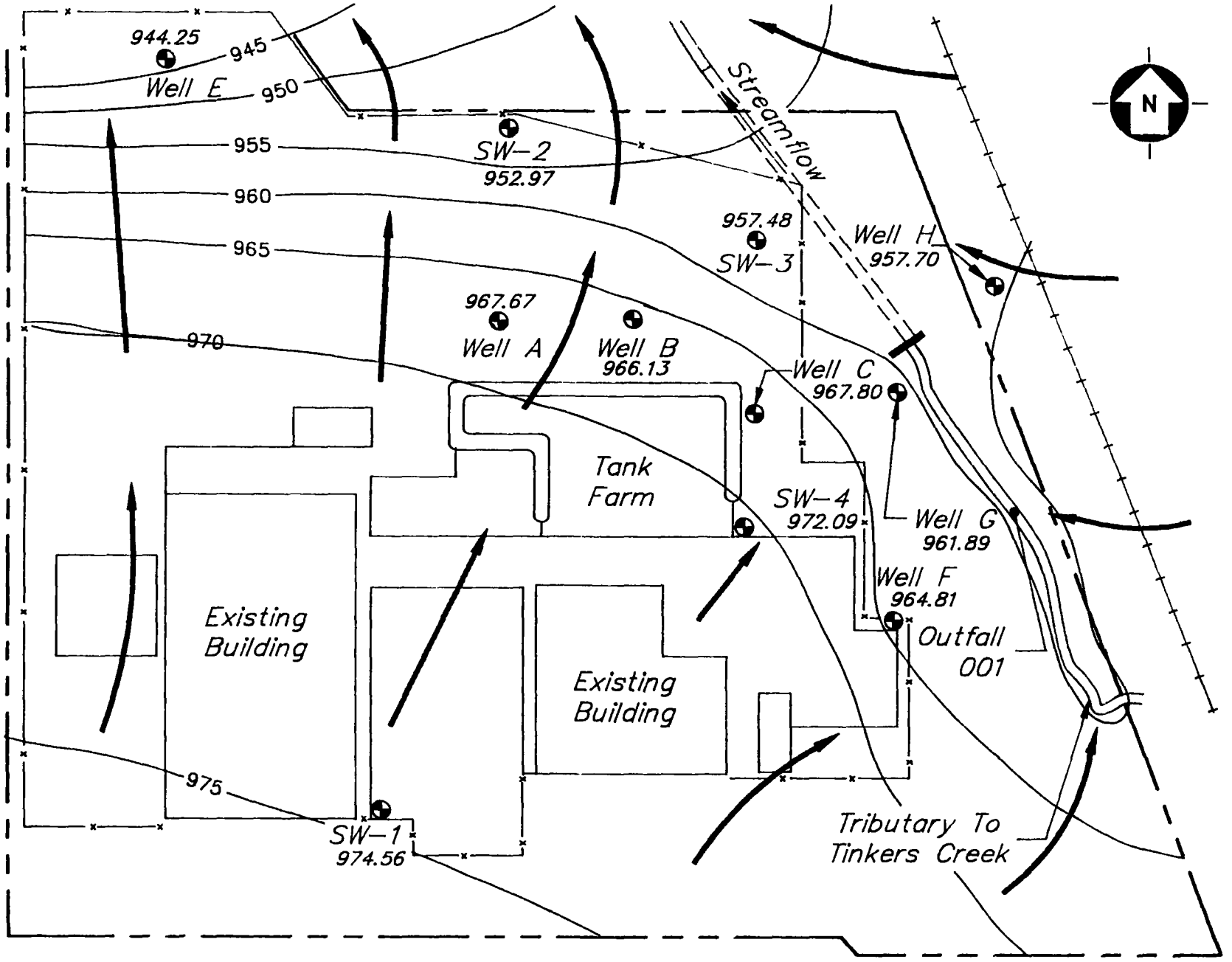

LEGEND

- MONITORING WELL
- FLOW DIRECTION
- [ELEVATIONS IN FEET]

GROUNDWATER FLOW & CONTOUR MAP

(APRIL 1988)

HUKILL CHEMICAL CORP.
BEDFORD, OHIO

0 100'

REF.# SK495-1C

FIGURE 3

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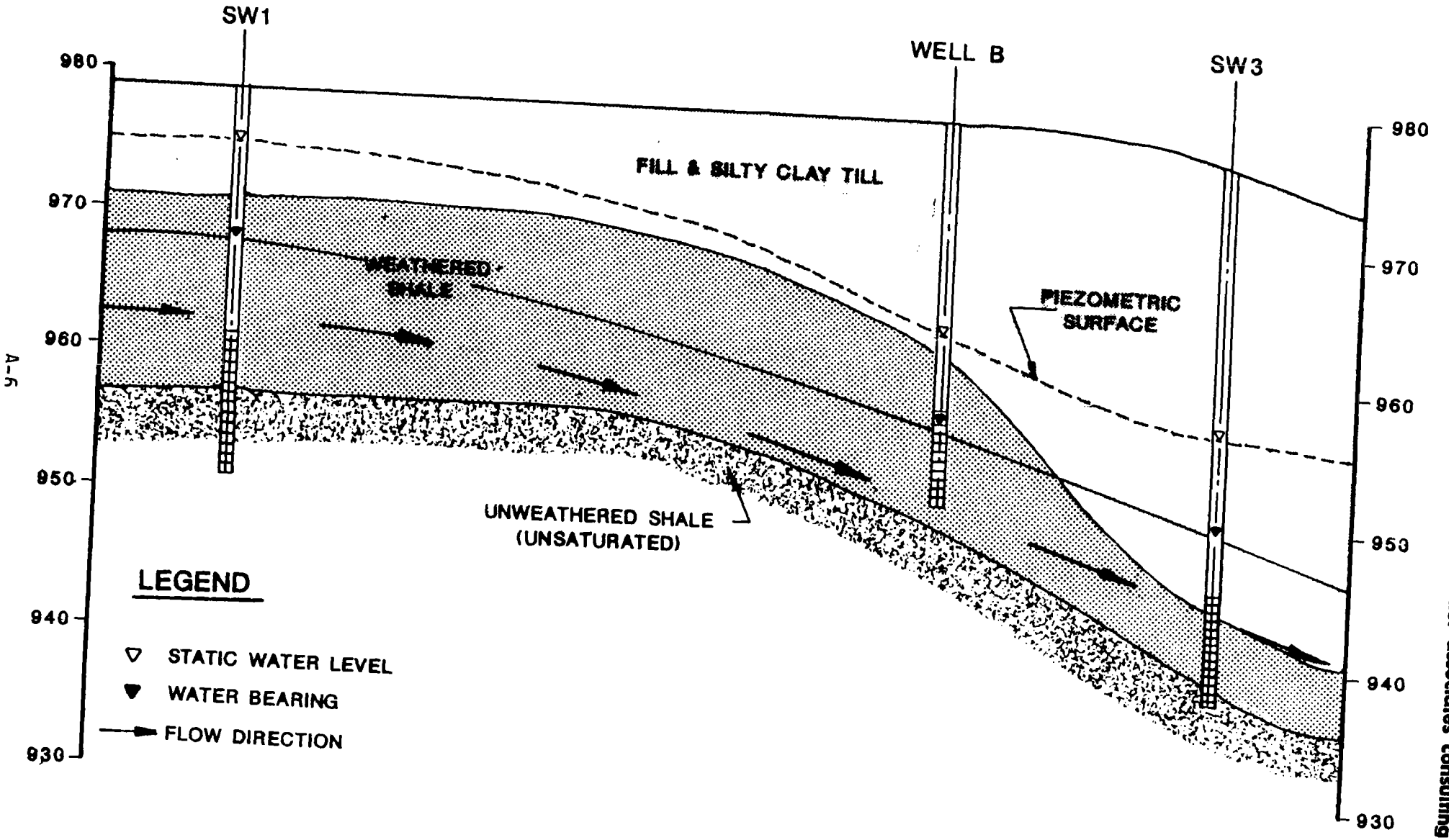


GROUNDWATER FLOW PATTERN

A-5

eder associates consulting engineers, p.c.

FIGURE 4

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 1

WATER LEVEL ELEVATIONS (ft)

Monitor Well	Date						
	September 1982	October 1982	May 1986	September 1986	October 1986	February 1987	April 1988
SW-1	974.65	975.09	974.06	974.96	--	(NA)	974.56
SW-2	952.76	953.00	952.85	--	953.70	953.85	952.97
SW-3	956.34	956.48	956.83	956.73	--	955.86	957.48
SW-4	969.23	970.86	972.29	971.79	--	971.21	972.09
A	(1)	(1)	967.24	965.69	--	966.17	967.67
B	(1)	(1)	964.55	963.35	--	963.72	966.13
C	(1)	(1)	966.60	964.90	--	965.77	967.80
E	(2)	--	--	--	943.87	944.22	944.25
F	(2)	--	--	--	965.15	969.12	964.81
G	(2)	--	--	--	961.44	961.07	961.89
H	(3)	--	--	--	--	--	957.70

Notes:

1. Wells A, B and C installed in April 1986
2. Wells E, F and G installed in September and October 1986
3. Well H installed in April 1988
4. (NA) not accessible

downward migration of shallow groundwater is prevented by the shale and it does not enter the underlying Berea or Sharpsville Sandstone aquifers.

The site investigation results indicate that the groundwater found in the weathered shale under the site is confined to a narrow zone near the till/shale interface. The flow pattern in this zone appears to be lateral into the creek which forms the northern and eastern boundaries of the property.

As part of a groundwater quality assessment program at a neighboring site (Egbert Corporation, formerly S.K. Wellman Corporation), three deep and eight shallow wells were installed at depths ranging from 70 to 80 ft. and 10 to 30 ft. respectively. Egbert Corporation retained Woodward-Clyde Consultants to conduct a site investigation for closure of a surface impoundment constructed in 1956 as part of on-site industrial wastewater treatment. Wastewater treatment sludge (Hazardous Waste Code F006) was stored in the impoundment.

Results of Woodard-Clyde's site study entitled "Implementation of Egbert Corporation's Groundwater Quality Assessment Program" indicate that, although groundwater was found during air-rotary drilling at depths ranging from 62 to 72 ft., once the deep wells were bailed dry, they did not recover an appreciable amount of water for several months. Static water levels in the deep wells screened in the Meadville shale were on the average 29 feet lower than static water levels in the shallow water table wells screened in the weathered zone. This indicates that the underlying shale at the Hukill and Egbert sites is aerially extensive, virtually impermeable and effectively prevents local recharge of the underlying sandstone aquifers.

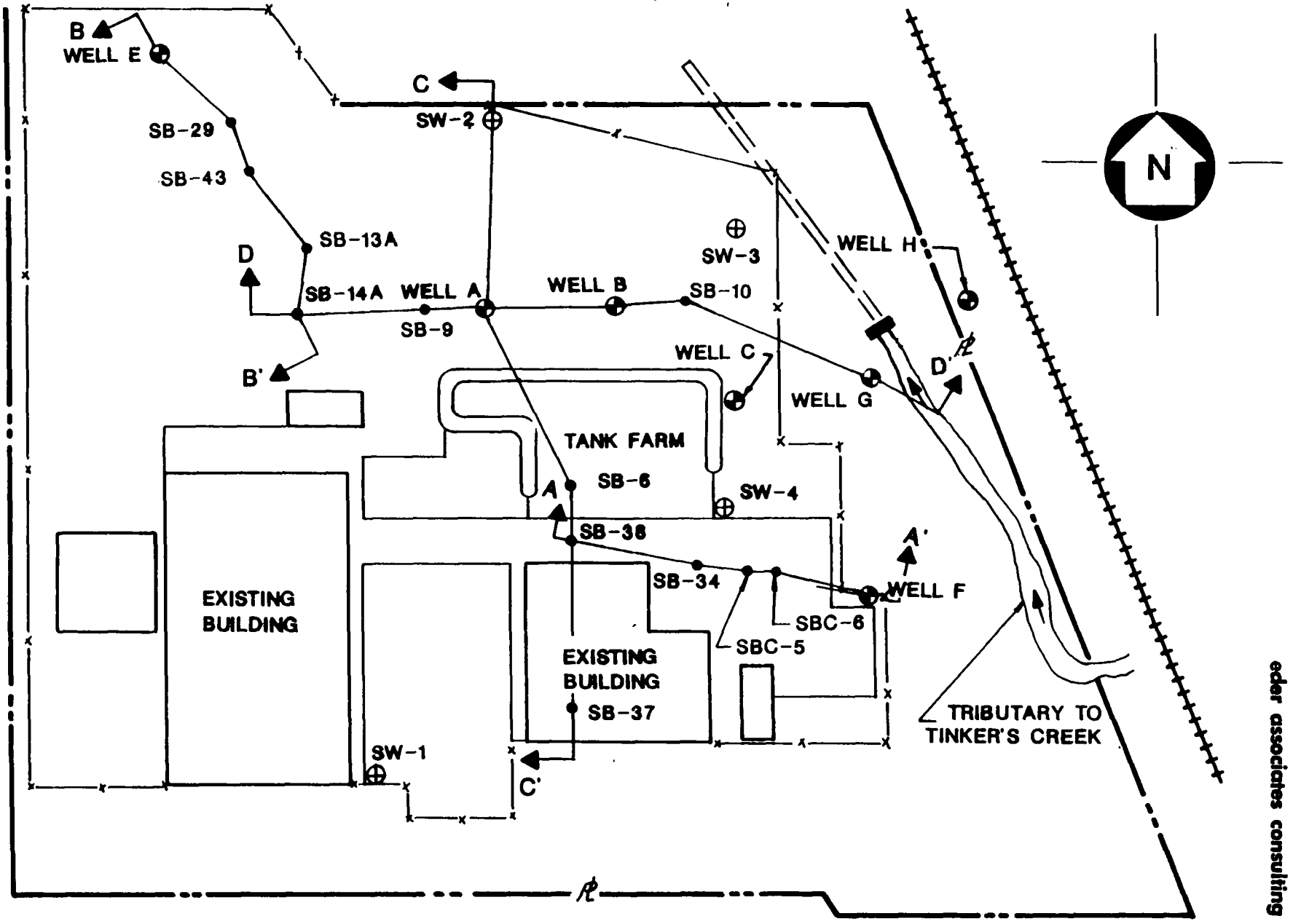
Groundwater flow at HCC is predominately to the north-northeast toward the alluvial deposits at the creek. Hydrologic gradients increase from 0.022 ft/ft in southern sections of the site to over 0.08 ft/ft in the northern section. The permeability of the confining

soils have been measured and are very low. Silty till deposits were found to have a permeability of 2.8 EE-5 cm/sec, while clayey till samples ranged from 2.2 EE-8 to 8.6 EE-8 cm/sec. A sample from the weathered shale zone was found to have a permeability of 2.4 EE-8 cm.sec. Although the absolute permeability of the weathered shale sediments was found to be quite low in the laboratory, this unit is quite permeable overall due to its high incidence of fractures (secondary permeability).

The hydraulic conductivity of Wells A and B were measured using the slug "falling head" test method. Slug testing involves either injecting from a well (falling head) or withdrawing (rising head) a slug of water of known volume. The rate at which the water rises or falls is controlled by the information characteristics. Based on the results of the tests, with calculations performed according to prescribed methods, the permeability at Well B was estimated to be 4.23 EE-04 cm/sec or 1.2 ft/day. A slug test was also attempted at Well A, however before any water level measurements could be made, the slug of water had already recharged into the formation. Slug tests are only practical for lower permeability materials. Permeability at Well A is assumed to be quite high, since fracturing in the shall is much more pronounced than in Well B. Throughout the site, serveral borings were drilled through the weathered zone without intercepting a saturated zone. These "dry holes" notably SBW-16, SB-18, SB-28, SB-32, SB-35, SB-38 and the original location for Well F, which had to be installed in SB-46 indicates that considerable variations in permeability exist throughout the shallow groundwater zone (weathered shale).

Estimates of groundwater flow rate would be difficult to calculate accurately in the weathered shale zone. The material exhibits changes in hydrologic conductivity due to varying amounts of fracture in the shale. Groundwater flow at the site may be described as occurring between highly fractured zones and zones where there is less conductivity of this groundwater system is controlled by the number of cracks and fractures present. The groundwater follows these cracks and fractures downgradient to the creek.

Drilling conducted at the plant process building, inside the tank farm, and around the cistern revealed a layer of perched groundwater. This water was found in the sandy fill material around underground piping under the east process building of the plant. Perched water was found above impermeable clay till deposits at 2 to 3 ft. below the concrete floor. Water also is present at the surface in the gravel base of the tank farm. It appears that the perched water in the tank farm is connected to the perched water found under the building by sand backfilling around underground plant piping and beneath facility structures (i.e., footings and foundations).



LEGEND

- MONITORING WELL (INSTALLED 1986 AND 1988)
- ⊕ MONITORING WELL (INSTALLED 1982)
- • SOIL BORING (SB)

SCALE 1"= 100'

LOCATION OF CROSS SECTIONS

FIGURE 5

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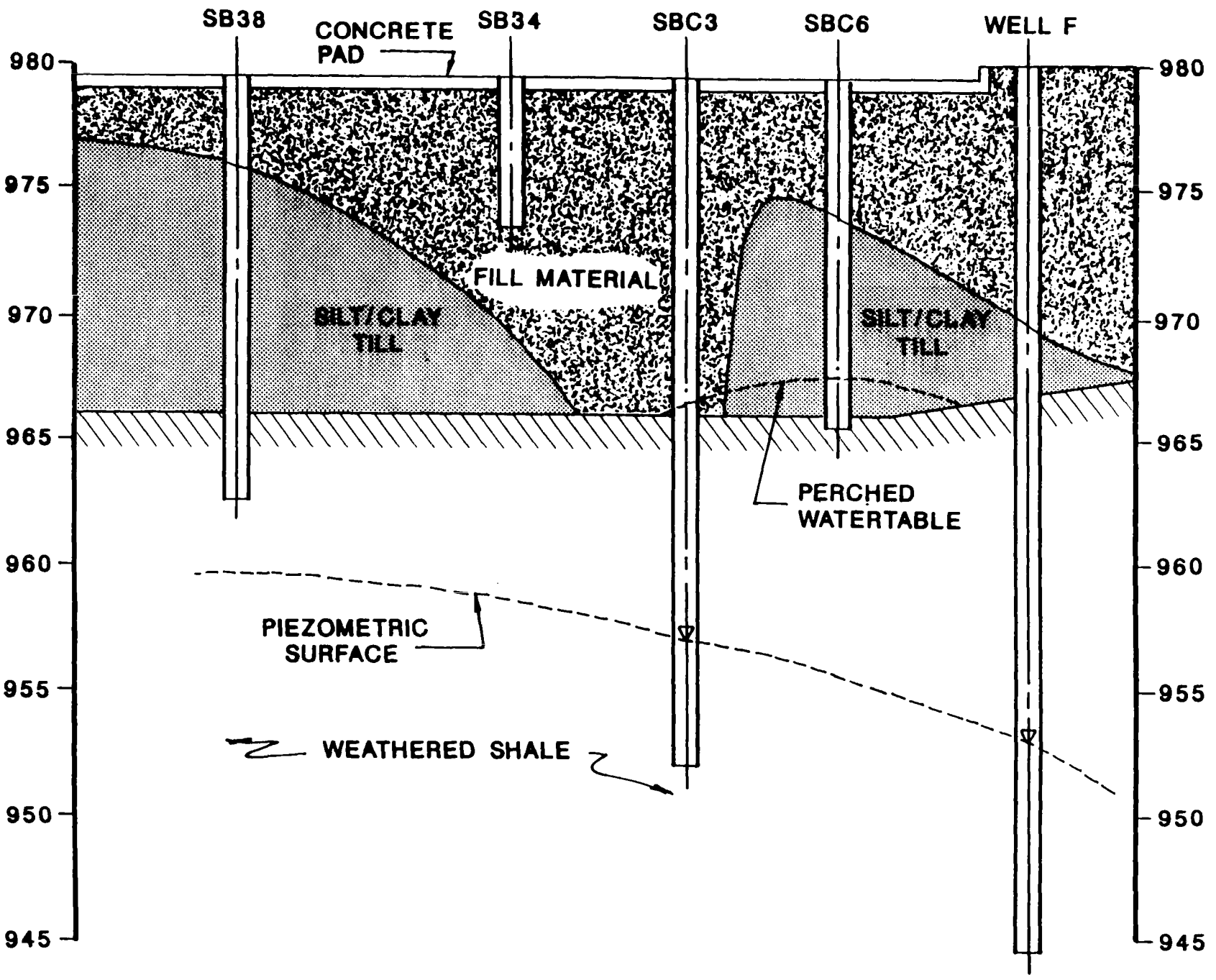

CROSS SECTION A–A

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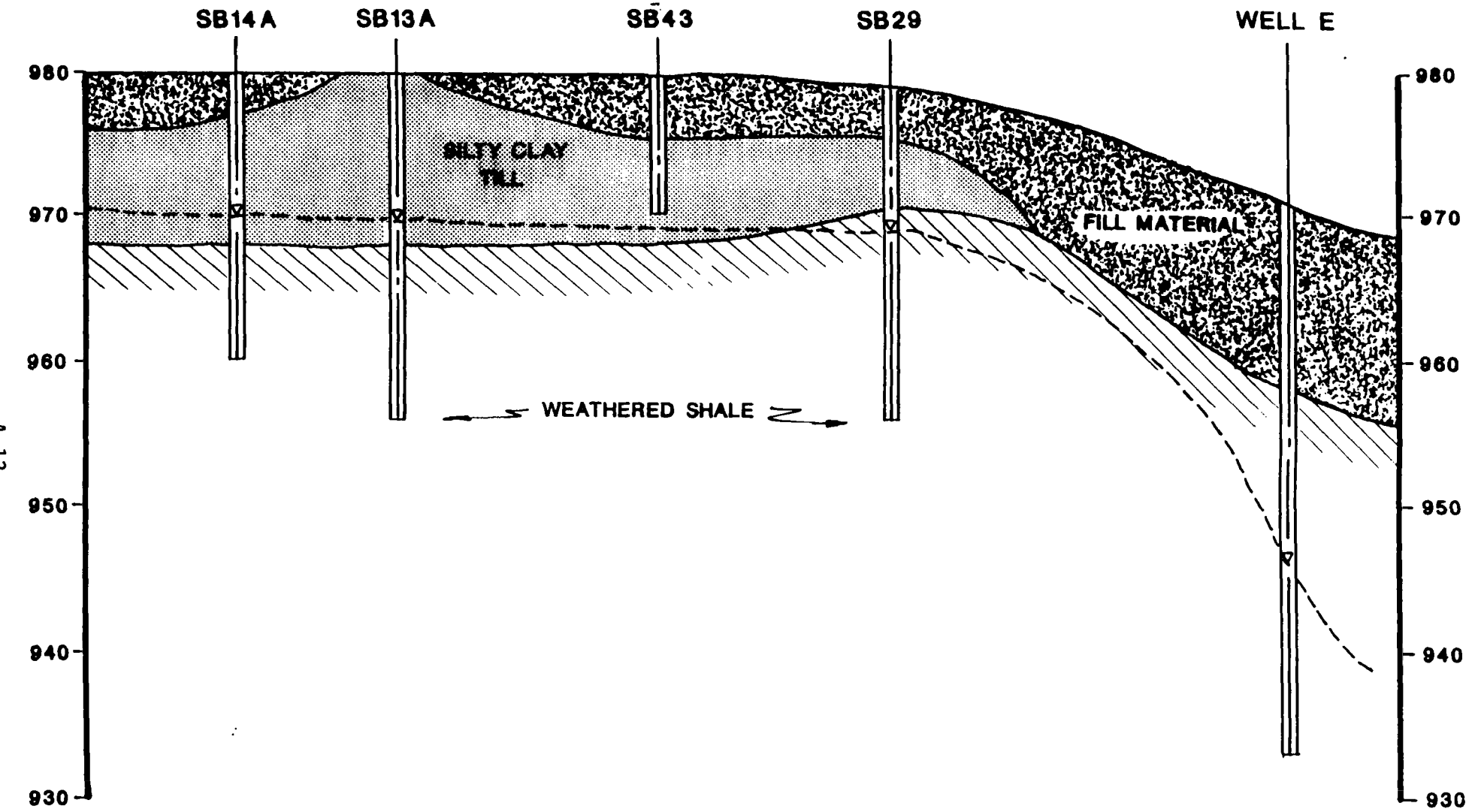
FIGURE 6



CROSS SECTION B-B

FIGURE 7

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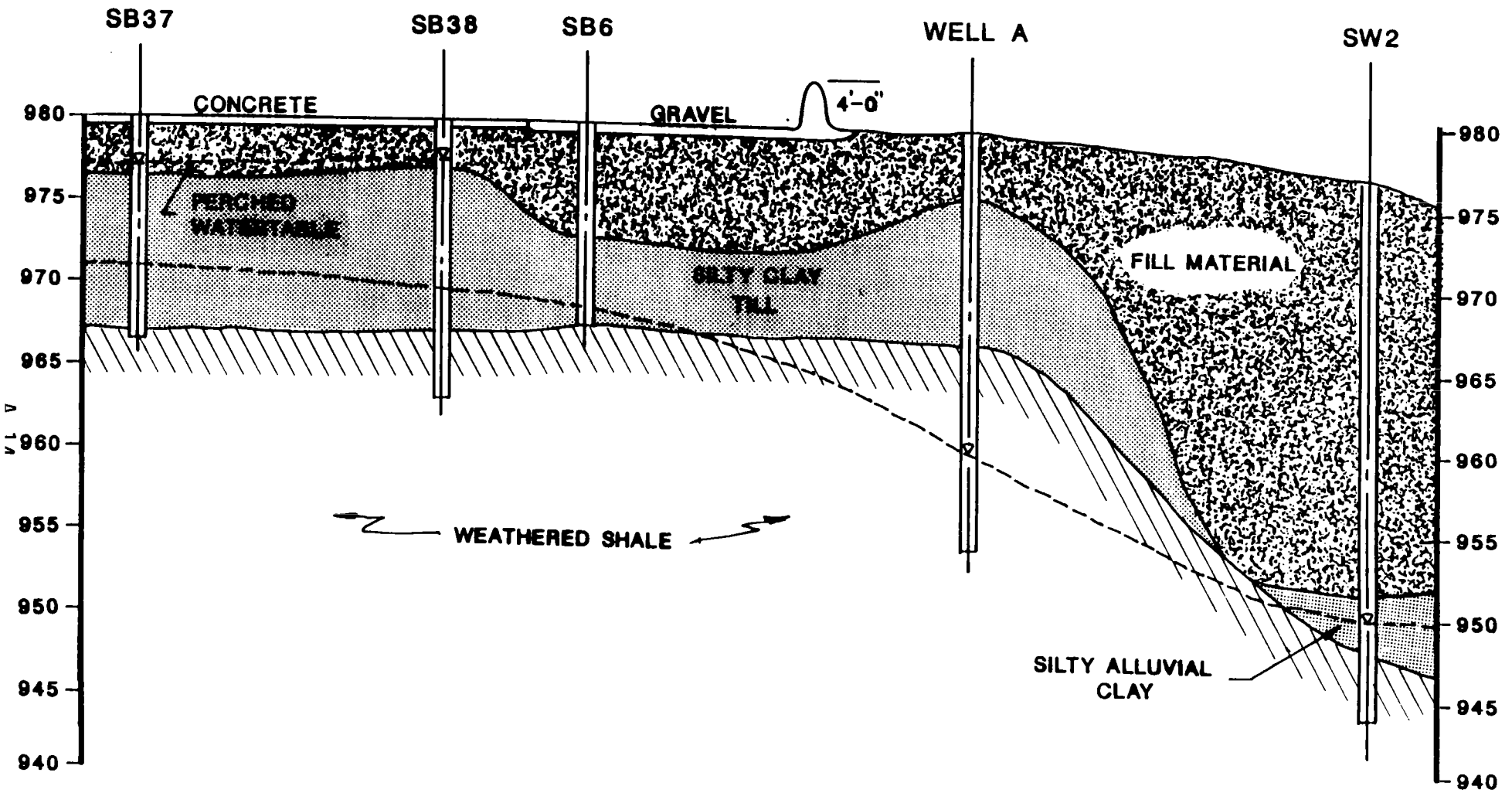
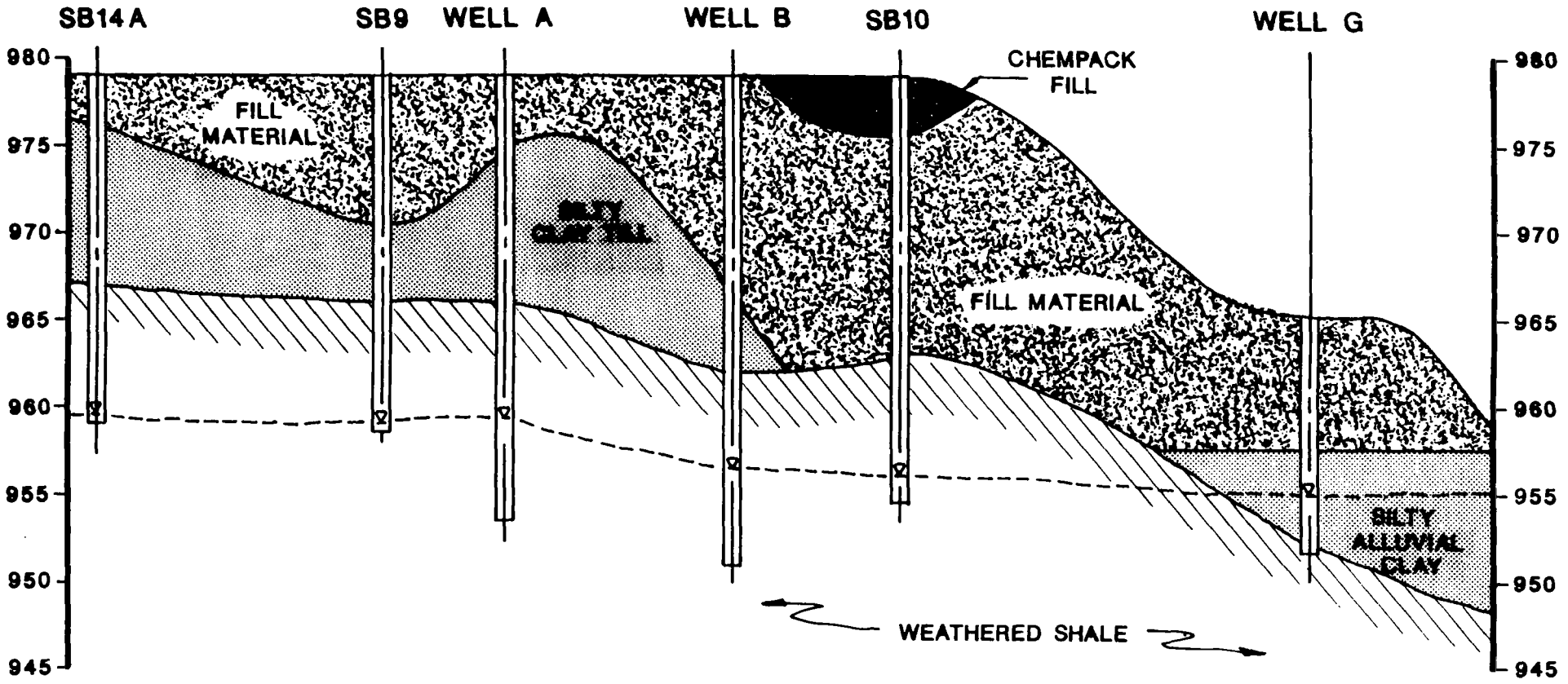


CROSS SECTION C-C

eder associates consulting engineers, p.c.

FIGURE 8



CROSS SECTION D-D

APPENDIX B

GROUNDWATER MONITORING RESULTS

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 61

GROUNDWATER MONITORING RESULTS
ORGANIC ANALYSES
MAY 1986

Sample Location	SW-1	SW-2[3]	SW-3	SW-4	A	B	B, Duplicate	B, Blank	C
Sample Number	GW-7	--	GW-5	GW-4	GW-1	GW-2	GW-2	GW-2	GW-3
Sample Date	5/17/86	--	5/17/86	5/16/86	5/16/86	5/16/86	5/16/86	5/16/86	5/16/86
Parameter (mg/l)									
Methylene Chloride	0.001 (J)	--	0.003 (J)	0.042	LD	440.0	490.0	0.010	1300.0
Acetone	0.014	--	0.020	0.047	LD	92.0	LD	0.056	LD
2-Butanone	LD	--	LD	0.023	LD	LD	LD	0.013	LD
Toluene	LD	--	LD	0.005	0.030	LD	LD	0.004 (J)	LD
1,1 Dichloroethane	LD	--	LD	0.016	0.006	LD	LD	LD	LD
Xylene	LD	--	LD	LD	0.030	LD	LD	0.002 (J)	LD
Ethyl Benzene	LD	--	LD	LD	0.005	LD	LD	LD	LD
4-Methyl-2-Pentanone	LD	--	LD	0.009 (J)	LD	LD	LD	LD	LD
Propane 2,2-Oxybis (Isopropyl Ether) (4)	LD	--	LD	0.080 (J)	LD	LD	LD	LD	LD
TOC	2.8	--	73.9	22.6	1.4	59.8	71.1	1.4	107.0
TOX	0.040	--	0.270	0.200	0.010	22.0	180.0	LD	120.0

NOTES:

1. LD indicates less than the detection limit.
2. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
3. No sample was collected for analyses because bailer could not be retrieved from well SW-2. Problem was rectified in September 1986 and sample was collected for analyses.
4. Propane 2,2' - oxybis (isopropyl ether) is not regulated as a hazardous substance.
5. (J) indicates compound identified and concentration estimated below the detection limit.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 62

GROUNDWATER MONITORING RESULTS
INORGANIC ANALYSES
MAY 1986

Sample Location	SW-1	SW-2[2]	SW-3	SW-4	A	B	B, Duplicate	B, Blank	C
Sample Number	GW-7	--	GW-5	GW-4	GW-1	GW-2	GW-2	GW-2	GW-3
Sample Date	5/17/86	--	5/17/86	5/16/86	5/16/86	5/16/86	5/16/86	5/16/86	5/16/86
Parameter (mg/l)									
Arsenic	LD	--	LD	LD	LD	LD	LD	LD	LD
Barium	LD	--	LD	0.210	LD	0.190	0.190	LD	0.100
Cadmium	LD	--	LD	LD	LD	LD	LD	LD	LD
Chromium	LD	--	LD	LD	LD	LD	LD	LD	LD
Lead	LD	--	LD	LD	LD	LD	LD	LD	LD
Mercury	LD	--	LD	LD	LD	LD	LD	LD	LD
Selenium (3)	LD	--	LD	LD	LD	LD	LD	LD	LD
Silver	LD	--	LD	LD	LD	LD	LD	LD	LD
pH	8.05	--	7.39	7.08	6.20	6.06	--	6.96	5.78
Conductivity-umohs/cm	3600	--	9250	4750	8750	6990	--	5.1	4700

NOTES:

1. LD indicates less than the detection limit. Detection limits are provided in the laboratory reports in Appendix C.
2. See Note 3, Table 60.
3. Spike sample recovery for selenium analysis was not within the control limits.
4. -- indicates parameter not analyzed.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 63

GROUNDWATER MONITORING RESULTS
ORGANIC ANALYSES
SEPTEMBER/OCTOBER 1986

Sample Location	SW-1	SW-2	SW-3	SW-4	A	B	C	E	F	F, Duplicate	F Blank	G
Sample Number	GW-1	GW-9	GW-2	GW-4	GW-3	GW-5	GW-6	GW-10	GW-7	GW-7	GW-7	GW-8
Sample Date	9/20/86	10/1/86	9/20/86	9/20/86	9/20/86	9/21/86	9/21/86	10/2/86	10/1/86	10/1/86	10/1/86	10/1/86
Parameter (mg/l)												
Methylene Chloride	0.180	0.007	0.100	0.170	0.170	610.0	1500.0	LD	0.047	0.007	LD	270.0
Toluene	0.002(J)	LD	LD	0.003(J)	0.002(J)	LD	LD	LD	LD	0.006	LD	3.6(J)
Xylene	LD	LD	LD	LD	LD	LD	LD	LD	0.012	0.017	LD	LD
1,2 Diethoxyethane	LD	LD	0.020(J)	LD	LD	LD	LD	LD	LD	LD	LD	LD
1,1 Dichloroethane	LD	LD	LD	0.012	LD	LD	LD	LD	LD	LD	LD	LD
2-Methyl, 2-Propanol	LD	LD	LD	0.010	LD	LD	LD	LD	LD	LD	LD	LD
2,2' Propane, Oxybis	LD	LD	LD	0.100	LD	LD	LD	LD	LD	LD	LD	LD
Vinyl Chloride	LD	LD	LD	LD	LD	LD	LD	LD	0.024	0.030	LD	LD
Trans, 1,2,- Dichloroethylene	LD	LD	LD	LD	LD	LD	LD	LD	0.240	0.250	LD	LD
TOC	7.6	20.9	83.8	9.6	1.3	83.8	134.0	4.6	5.5	5.7	1.1	44.5
TOX	LD	0.022	0.180	0.016	LD	25.0	40.0	0.026	0.170	0.160	0.011	53.0

NOTES:

1. Wells E, F and G were installed in September 1986.
2. LD indicates less than the detection limit.
3. Isopropyl ether (2-2' Oxybispropane) is not a regulated hazardous chemical.
4. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory reports in Appendix C.
5. (J) indicates compound identified and concentration estimated below the detection limit.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 64

GROUNDWATER MONITORING RESULTS
INORGANIC ANALYSES
SEPTEMBER/OCTOBER 1986

Sample Location	SW-1	SW-2	SW-3	SW-4	A	B	C	E	F	F, Duplicate	F Blank	G
Sample Number	GW-1	GW-9	GW-2	GW-4	GW-3	GW-5	GW-6	GW-10	GW-7	GW-7	GW-7	GW-8
Sample Date	9/20/86	10/1/86	9/20/86	9/20/86	9/20/86	9/21/86	9/21/86	10/2/86	10/1/86	10/1/86	10/1/86	10/1/86
Parameter (mg/l)												
Arsenic (1)	LD	LD	LD	LD	LD	0.018	LD	LD	LD	LD	LD	LD
Barium	LD	0.070	LD	LD	LD	0.280	0.090	LD	0.090	0.090	LD	0.140
Cadmium	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD
Chromium (T)	0.010	0.018	0.012	LD	LD	LD	LD	0.012	0.022	LD	LD	LD
Lead (1) (2)	LD	0.014	.006	LD	0.018	LD	LD	LD	LD	0.010	LD	LD
Mercury	0.001	0.0027	0.0003	0.0006	0.001	0.0009	0.0008	0.0007	0.0005	--	LD	0.0003
Selenium	LD	LD	(S)	LD	LD	LD	LD	LD	LD	LD	LD	LD
Silver	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD
pH	7.12	6.84	7.54	7.10	6.32	6.11	5.87	6.37	7.74	--	--	6.82
Conductivity-umohs/cm	3000	1350	9500	3500	1400	3250	1700	1750	1800	--	--	4000

NOTES:

1. Spike sample recovery was not within the control limits.
2. Duplicate analysis was not within the control limits.
3. NA is not applicable.
4. -- indicates parameter not analyzed
5. Detection limits are provided in the laboratory reports in Appendix C.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 65

GROUNDWATER MONITORING RESULTS
INORGANIC ANALYSES
SEPTEMBER/OCTOBER 1986

Sample Location	SW-1	SW-2	SW-3	SW-4	A	B	C	E	F	F, Duplicate	F Blank	G
Sample Number	GW-1	GW-9	GW-2	GW-4	GW-3	GW-5	GW-6	GW-10	GW-7	GW-7	GW-7	GW-8
Sample Date	9/20/86	10/1/86	9/20/86	9/20/86	9/20/86	9/21/86	9/21/86	10/2/86	10/1/86	10/1/86	10/1/86	10/1/86
Parameter (mg/l)												
Copper	0.037	0.488	0.025	--	--	--	--	0.074	0.023	0.031	0.023	0.028
Iron	1.2	19.60	0.200	--	--	--	--	23.8	0.580	0.670	LD	--
Nickel	LD	LD	LD	--	--	--	--	LD	LD	LD	LD	0.179
Manganese	--	6.720	--	--	--	--	--	2.420	0.068	0.062	LD	3.580
Zinc	--	1.230	--	--	--	--	--	0.367	0.054	0.052	0.041	2.340
Chloride	16.0	84.0	330.0	--	--	--	--	530.0	170.0	170.0	LD	490.0
Fluoride	0.7	0.30	0.20	--	--	--	--	0.2	0.80	0.70	LD	0.70
Phosphorus (T)	LD	0.20	LD	--	--	--	--	LD	LD	LD	LD	LD
Sulfate	480.0	93.0	2200.0	--	--	--	--	135.0	77.0	75.0	LD	142.0

NOTES:

1. LD indicates less than the detection limit.
2. -- indicates parameter was not analyzed.
3. Refer to laboratory results in Appendix C for detection limits.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 66

GROUNDWATER MONITORING RESULTS
ORGANIC ANALYSES
FEBRUARY 1987

Sample Location	Well A	Well A Duplicate	SW-3	SW-4	Well G
Sample Number	W-1	W-1A	W-2	W-3	W-4
Sample Depth (ft)	2/20/87	2/20/87	2/20/87	2/20/87	2/20/87
Parameter (mg/l)					
Methylene Chloride	LD	LD	0.005	0.230	730
Acetone	0.026	0.029	0.004 (J)	0.190	730
Vinyl Chloride	LD	LD	LD	0.012	LD
1,1 Dichloroethane	0.007	0.006	LD	0.013 (J)	LD
Trans, 1-2 Dichloroethylene	LD	LD	LD	0.014 (J)	LD
Ethyl Ether	LD	LD	0.022 (J)	LD	LD
1,4-Dioxane	LD	LD	0.009 (J)	LD	LD
Isopropyl Ether (3)	LD	LD	LD	0.097 (J)	LD

NOTES:

1. LD indicates less than the detection limit.
2. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
3. Isopropyl ether is not regulated as a hazardous substance.
4. (J) indicates compound identified and concentration estimated below the detection limit.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 67

GROUNDWATER MONITORING RESULTS
INORGANIC ANALYSIS
APRIL 1988

Sample Location	SW-1	SW-2	SW-3	SW-3(Dup)	SW-4	A	B	C	E	E, Blank	F	G	H
Sample ID	MWSW1	MWSW2	MWSW3	MWSW3D	MWSW4	MWA	MWB	MWC	MWE	MWEFB	MWF	MWG	MWH
Sample Date	4/13/88	4/13/88	4/14/88	4/14/88	4/14/88	4/14/88	4/14/88	4/14/88	4/13/88	4/13/88	4/13/88	4/15/88	4/15/88
Parameter (mg/l)													
Arsenic	LD	LD	LD	LD	0.030	LD	0.012	LD	LD	LD	LD	LD	LD
Barium	LD	LD	LD	LD	LD	LD	0.359	0.090	LD	LD	LD	LD	0.071
Cadmium	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	0.009	0.005
Chromium	LD	LD	LD	LD	LD	0.001	LD	LD	LD	LD	LD	LD	0.025
Copper	0.029	0.031	LD	LD	LD	LD	LD	LD	LD	0.024	LD	LD	LD
Iron	LD	LD	0.313	0.196	45.80	45.6	LD	74.7	1.82	LD	LD	131.0	131.0
Lead (1)	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD
Mercury	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD
Zinc	0.058	0.023	LD	0.013	LD	0.032	0.018	0.032	0.013	LD	LD	0.034	0.028

NOTES:

1. Spike sample recovery was not within the control limits.
2. LD indicates less than the detection limit. Detection limits are provided in the laboratory reports in Appendix C.
3. Dup: Indicates Duplicate Samples.

R-7

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 68

GROUNDWATER MONITORING RESULTS
ORGANIC ANALYSIS
APRIL 1988

Sample Location	SW-1	SW-2	SW-3	SW-4	A	B	C	E	F	G	G, Dup	G, Blank	H
Sample ID	MW-SW-1	MW-SW-2	MW-SW-3	MW-SW-4	MW-A	MW-B	MW-C	MW-E	MW-F	MW-G	MW-G Dup	MWG-FB	MW-H
Sample Date	4/13/14	4/13/88	4/14/88	4/14/88	4/14/88	4/14/88	4/14/88	4/13/88	4/13/88	4/15/88	4/15/88	4/15/88	4/15/88
Parameter (mg/l)													
Chloromethane	0.011	LD	LD	LD	LD	0.025	LD	LD	LD	LD	LD	LD	LD
Vinyl Chloride	LD	LD	LD	0.014	LD	0.019	LD	LD	LD	LD	LD	LD	LD
Chloroethane	LD	LD	LD	0.005(J)	LD	0.042	LD	LD	LD	LD	LD	LD	LD
Methylene Chloride (1)	LD	0.010	LD	LD	0.011	330.0	7400.0	LD	LD	280.0	250.0	LD	LD
Acetone (1)	0.030	0.021	0.012	0.013	0.009(J)	LD	LD	LD	0.008(J)	LD	LD	0.011	0.006(J)
Carbon Disulfide	LD	LD	LD	LD	LD	0.008	LD	LD	LD	LD	LD	LD	LD
1,1-Dichloroethene (1)	0.006	LD	0.004(J)	0.005	0.007	0.025	41.0(J)	0.005	0.005	LD	LD	LD	0.004(J)
1,1-Dichloroethane	LD	LD	LD	0.012	0.029	(Note 5)	LD	LD	LD	LD	LD	LD	LD
1,2-Dichloroethene	LD	LD	LD	0.070	LD	(Note 5)	LD	LD	0.260	LD	LD	LD	LD
1,2-Dichloroethane	LD	LD	LD	LD	LD	0.009	LD	LD	LD	LD	LD	LD	LD
2-Butanone (1)	0.007(J)	0.006(J)	0.007(J)	LD	0.006(J)	LD	420.0	0.004(J)	0.006(J)	7.20(J)	LD	0.011	0.007(J)
1,1,1-Trichloroethane	LD	0.005	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD
Vinyl Acetate (1)	0.007(J)	0.006(J)	LD	LD	0.006(J)	20.0	LD	0.004(J)	0.006(J)	LD	LD	LD	LD
Trichloroethene	LD	LD	LD	LD	LD	(Note 5)	LD	LD	LD	LD	LD	LD	LD
4-Methyl-2-Pentanone (1)	LD	LD	LD	0.030	LD	0.070	LD	LD	LD	LD	LD	0.023	LD
2-Hexanone (1)	LD	LD	0.008(J)	LD	LD	LD	LD	LD	LD	LD	LD	0.093	LD

Table 68 continued . . .

Sample Location	SW-1	SW-2	SW-3	SW-4	A	B	C	E	F	G	G, Dup	G, Blank	H
Sample ID	MW-SW-1	MW-SW-2	MW-SW-3	MW-SW-4	MW-A	MW-B	MW-C	MW-E	MW-F	MW-G	MW-G Dup	MWG-FB	MW-H
Sample Date	4/13/14	4/13/88	4/14/88	4/14/88	4/14/88	4/14/88	4/14/88	4/13/88	4/13/88	4/15/88	4/15/88	4/15/88	4/15/88
Parameter (mg/l)													
Tetrachloroethene	LD	LD	LD	LD	0.010	0.150	LD	LD	LD	LD	LD	LD	LD
Toluene	LD	LD	LD	LD	LD	0.850	LD	LD	LD	LD	LD	LD	LD
Ethylbenzene	LD	LD	LD	LD	LD	0.033	LD	LD	LD	LD	LD	LD	LD
Total Xylenes	LD	LD	LD	LD	LD	0.062	LD	LD	LD	LD	LD	LD	LD
Ethane, 1,1,2-Trichloro-1,2,	LD	LD	0.005(J)	LD	0.022(J)	LD	LD	LD	LD	9.10(J)	1.9(J)	LD	LD
7,10-Methanofluoranthen-11-0	LD	LD	LD	0.001(J)	LD	LD	LD	LD	LD	LD	LD	LD	LD
Diisopropyl Ether (DOT)	LD	LD	LD	0.120(J)	LD	LD	LD	LD	LD	LD	LD	LD	LD
Ethane, 1,2-Dichloro-1,1,2-T	LD	LD	LD	LD	0.071(J)	LD	LD	LD	LD	LD	LD	LD	LD

NOTES:

1. Compounds identified in blank samples.
2. LD indicats less than the detection limit.
3. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
4. J indicates compound identified and concentration estimated below the detection limit.
5. Compound was detected but the concentration exceeded the calibration range of the GC/MS and in accord with CLP protocol the sample was diluted and reanalyzed. The concentration of this compound was below the detection limit of the diluted sample and therefore could not be quantified.
6. Dup: Indicates duplicate analysis.

APPENDIX C

SOLVENT TANK FARM SOIL SAMPLING ANALYSES

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 13

TANK FARM SOIL SAMPLING
ORGANIC ANALYSES

Sample Location	SB-1	SB-3	SB-4	SB-4	SB-4	Well C	SB-11	SB-17
Sample Number	SS-158	SS-165	SS-176	SS-176 Dup.	SS-176 Blank	SS-66	SS-93	SS-108
Sample Depth (ft)	1.5-3.0	3.0-4.5	1.5-3.0	1.5-3.0	NA	3.0-4.5	1.5-3.0	1.5-3.0
Parameter (mg/kg)								
Methylene Chloride	0.810 (J)	4.3	2.5	4.0	0.031	4.6	13.0	0.093
Acetone	5.9	8.5	5.6	4.1	0.055	7.4	11.0 (J)	0.074
2-Butanone	11.0	8.3	7.7	7.1	LD	3.2	LD	LD
Tetrachloroethylene	LD	2.1	2.2	0.990	LD	LD	15.0	0.007 (J)
Toluene	LD	LD	0.720	0.790	LD	1.4	330.0	LD
Ethyl Benzene	LD	LD	1.7	1.8	LD	1.3	110.0	LD
Total Xylene	5.2	LD	8.8	9.3	LD	6.3	490.0	LD
1,1,2-Trichloro-1,2,2-Trifluoroethane	LD	LD	LD	LD	0.020 (J)	LD	LD	0.100 (J)
Trimethylsilanol	LD	LD	LD	LD	0.007 (J)	LD	LD	LD
1,2,3-Trimethyl Benzene	LD	LD	LD	LD	LD	4.0 (J)	LD	LD
1-Ethyl-2-Methyl Benzene	LD	LD	LD	LD	LD	3.0 (J)	LD	LD
Tetrahydrofuran	LD	LD	LD	LD	LD	LD	LD	0.010 (J)
Total VOCs	22.91	23.2	29.22	28.08	0.113	31.2	969.0	0.284
OVA Reading (ppm)	200	GT1000	1000	---	---	GT1000	GT1000	8.5

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Dup. indicates duplicate analyses
4. GT indicates greater than.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 14

TANK FARM SOIL SAMPLING
ORGANIC ANALYSES

Sample Location	SB-1	SB-1	SB-1	SB-3	SB-4	SB-4	Well C
Sample Number	SS-162	SS-162 Dup.	SS-162 Blank	SS-167	SS-179	SS-179 RA	SS-70
Sample Depth (ft)	16.5-17.0	16.5-17.0	NA	12.0-13.5	12-13.5	12-13.5	16.0-17.5
Parameter (mg/kg)							
Methylene Chloride	0.260	0.480	0.031	29.0	58.0	110.0	21.0
Acetone	0.940	0.620	0.017	52.0	17.0	26.0	4.1
1,1-Dichloroethane	LD	LD	LD	LD	LD	LD	0.300 (J)
2-Butanone	0.044	0.072	LD	36.0	6.2	8.3	5.2
1,1,1-Trichloroethane	0.031	0.110	LD	42.0	LD	8.6	LD
Trichloroethylene	LD	0.026 (J)	LD	LD	LD	6.1	LD
Tetrachloroethylene	LD	0.062	LD	800.0	LD	LD	LD
Toluene	0.028	0.081	LD	32.0	LD	LD	4.5
Ethyl Benzene	LD	0.006 (J)	LD	LD	LD	LD	0.440 (J)
Total Xylene	0.006 (J)	0.015 (J)	LD	LD	LD	LD	2.0
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.200 (J)	0.200 (J)	0.020 (J)	LD	LD	LD	LD
Chloroform	LD	LD	LD	LD	LD	LD	LD
4-Methyl-2-Pentanone	LD	LD	LD	LD	LD	LD	LD
Total VOCs	1.509	1.672	0.068	991	81.2	159	37.54
OVA Reading (ppm)	3.0	---	---	GT 1000	GT 1000	---	GT 1000

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. RA indicates reanalysis. Sample SS-179 was reanalyzed. Samples SS-179 and SS-179 RA had low volatile organic analysis (VOA) surrogates for Toluene-D8 and Bromofluorobenzene. This indicates matrix interference. See "Water Surrogate Percent Recovery" in Appendix C.
4. NA indicates not applicable
5. Dup. indicates duplicate analyses
6. GT indicates greater than.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 15

TANK FARM SOIL SAMPLING
ORGANIC ANALYSES

Sample Location	Well C	Well C	SB-11	SB-11	SB-11	SB-11	SB-17
Sample Number	SS-70 Dup.	SS-70 Blank	SS-96	SS-96 RA	SS-96 Dup.	SS-96 Blank	SS-110
Sample Depth (ft)	16.0-17.5	NA	12-13.5	12-13.5	12-0-13.5	NA	7.5-9.0
Parameter (mg/kg)							
Methylene Chloride	16.0	0.015	3.7	1.6 (J)	1.7	0.015	0.015
Acetone	2.8	0.002 (J)	13.0	5.4 (J)	1.7	0.005 (J)	0.006 (J)
1,1-Dichloroethane	0.300 (J)	LD	LD	LD	LD	LD	LD
2-Butanone	3.2	0.003 (J)	3.9	8.3	2.7	0.002 (J)	LD
1,1,1-Trichloroethane	LD	LD	LD	LD	0.390 (J)	LD	LD
Trichloroethylene	LD	LD	LD	LD	LD	LD	LD
Tetrachloroethylene	0.320 (J)	LD	2.2 (J)	1.4 (J)	1.1 (J)	LD	LD
Toluene	10.0	LD	54.0	32.0	25.0	0.001 (J)	LD
Ethyl Benzene	0.720	LD	25.0	15.0	12.0	LD	LD
Total Xylene	3.3	LD	110.0	70.0	51.0	LD	LD
1,1,2-Trichloro-1,2,2-Trifluoroethane	LD	LD	LD	LD	LD	LD	LD
Chloroform	LD	0.001 (J)	LD	LD	LD	LD	LD
4-Methyl-2-Pentanone	LD	LD	LD	2.8 (J)	1.4 (J)	LD	LD
Styrene	LD	LD	LD	LD	LD	0.003 (J)	LD
Total VOCs	36.64	0.021	211.8	136.5	96.99	0.026	0.021
OVA Reading (ppm)	---	---	+1000	---	---	---	15.4

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. NA indicates not applicable
4. Dup. indicates duplicate analyses
5. Sample number SS-96 was reanalyzed (SS-96 RA) because VOA surrogates were outside QC limits. Sample SS-96 RA surrogates were within QC limits.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 16

TANK FARM SOIL SAMPLING
ORGANIC ANALYSES

Sample Location	SB-8	SB-8	SB-8	SB-6	SB-7	SB-12	SB-18
Sample Number	SS-122	SS-122 Dup.	SS-122 Blank	SS-171	SS-181	SS-101	SS-116
Sample Depth (ft)	1.5-3.0	1.5-3.0	NA	1.5-3.0	1.5-3.0	3.0-4.5	3.0-4.5
Parameter (mg/kg)							
Methylene Chloride	1.1	1.0 (J)	0.026	0.980	3.6	2.2	14.0
Acetone	4.3	5.5	0.015	2.9	12.0	19.0	3.5
Trans-1,2 Dichloroethylene	LD	0.430 (J)	LD	LD	LD	1.7	LD
2-Butanone	4.7	8.8	LD	5.6	6.3	6.3	5.3
1,1,1 Trichloroethane	LD	LD	LD	LD	7.0	LD	6.0
Trichloroethylene	LD	LD	LD	LD	17.0	LD	7.7
4-Methyl-2-Pentanone	LD	LD	LD	LD	LD	LD	4.3
Tetrachloroethylene	4.5	8.0	LD	LD	LD	LD	2.1
Toluene	LD	LD	LD	LD	65.0	LD	26.0
Ethyl Benzene	LD	LD	LD	1.3	13.0	0.540	8.1
Total Xylene	LD	LD	LD	3.0	67.0	4.5	47.0
1,1,2 Trichloro-1,2,2 Trifluoroethane	LD	LD	0.020 (J)	LD	LD	LD	LD
Trimethylsilanol	LD	LD	0.005 (J)	LD	LD	LD	LD
1,1,2 Trimethylcyclohexane	LD	9.0	LD	LD	LD	LD	LD
2,3,4-Trimethylhexane	LD	22.0	LD	LD	LD	LD	LD
Total VOCs	14.6	54.73	0.066	13.780	190.9	34.24	124.0
OVA Reading (ppm)	100	--	--	GT 1000	GT 1000	GT 1000	GT 1000

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Dup. indicates duplicate analyses
4. Sample number SS-122 and SS-122 Dup were analyzed outside the 14 day holding time. Actual holding time was 16 days.
5. GT indicates greater than.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 17

TANK FARM SOIL SAMPLING
ORGANIC ANALYSES

Sample Location	SB-8	SB-6	SB-7	SB-12	SB-18
Sample Number	SS-126	SS-173	SS-184	SS-106	SS-119
Sample Depth (ft)	16.5-17.0	7.5-9.0	12.0-13.5	23.5-24.0	16.5-17.0
Parameter (mg/kg)					
Methylene Chloride	1.4	27.0	0.270	0.078	0.160
Acetone	4.9	37.0	0.200	0.250	0.170
2-Butanone	5.0	32.0	0.036 (J)	0.023 (J)	0.019 (J)
1,1,1 Trichloroethane	LD	LD	0.090	LD	0.011 (J)
Tetrachloroethylene	19.0	LD	LD	LD	LD
Toluene	LD	340.0	0.073	0.051	0.026
Ethyl Benzene	LD	120.0	0.005 (J)	0.012 (J)	LD
Total Xylene	LD	450.0	0.025 (J)	0.071	0.028
1,1,2 Trichloro-1,2,2 Trifluoroethane	LD	LD	0.050 (J)	LD	0.030 (J)
Trimethylsilanol	LD	LD	0.040 (J)	LD	0.010 (J)
Total VOCs	30.3	1006.	0.789	0.485	0.454
OVA Readings (ppm)	20	GT1000	120	90	30

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Dup. indicates duplicate analyses
4. NA indicates not applicable
5. GT indicates greater than

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 18

SOIL SAMPLING
OUTSIDE TANK FARM BERM
ORGANIC ANALYSES

Sample Location	SB-9	SB-9	Well A	Well A	Well A	Well B	Well B	Well B	Well B	Well B	SB-10	SB-10
Sample Number	SS-76	SS-79	SS-53	SS-55	SS-56	SS-59	SS-59 Dup	SS-59 Blank	SS-60	SS-63	SS-84	SS-90
Sample Depth (ft)	1.5-3.0	12.0-13.5	7.5-9.0	16.5-17.0	20.0-20.5	3.0-4.5	3.0-4.5	NA	7.5-9.0	20.5-21.0	4.5-6.0	19.0-20.0
Parameter (mg/kg)												
Methylene Chloride	0.017	.021	1.9	0.005	0.011	0.007	0.010	0.023	0.007	0.011	0.058	5.1
Acetone	0.020	.035	0.820 (J)	0.030	0.026	0.033	0.043	0.076	0.110	0.070	0.570	8.5
2-Butanone	LD	.004 (J)	2.4	0.005	LD	0.005 (J)	LD	LD	0.027	0.005 (J)	0.160	3.8
1,1,1-Trichloroethane	LD	LD	LD	0.006	LD	LD	LD	LD	LD	LD	LD	LD
4-Methyl-2-Pentanone	LD	LD	LD	LD	0.005	LD	LD	LD	LD	LD	LD	LD
2-Hexanone	LD	LD	LD	0.005 (J)	LD	LD	LD	LD	LD	0.005 (J)	LD	LD
1,1 Dichloroethane	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	0.009(J)	LD
Toluene	0.002 (J)	LD	9.8	0.032	0.042	LD	LD	LD	0.004 (J)	0.001 (J)	0.038	1.1
Ethyl Benzene	LD	LD	5.8	0.007	0.013	LD	LD	LD	LD	LD	LD	3.6
Total Xylenes	LD	LD	29.0	0.032	0.055	LD	LD	LD	0.002 (J)	LD	LD	18.0
1,1,2-Trichloro-1,2,2-Trifluoroethane	LD	LD	LD	0.010 (J)	0.010 (J)	0.020 (J)	0.40 (J)	LD	0.010 (J)	LD	LD	LD
Trichlorofluoromethane	LD	LD	LD	LD	0.009 (J)	LD	LD	LD	LD	LD	LD	LD
Carbon Disulfide	LD	LD	LD	LD	LD	LD	LD	LD	LD	0.005 (J)	LD	LD
Propyl Benzene	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	LD	3.0 (J)
Total VOCs	0.039	0.06	49.72	0.132	0.171	0.065	0.453	0.099	0.16	0.097	0.835	43.1
OVA Reading (ppm)	3.0	4.0	GT 1000	68	2.6	0	--	--	55	1.5	50	GT 1000

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Dup. indicates duplicate analyses.
4. NA indicates not applicable.
5. GT indicates greater than.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 19

TANK FARM SOIL SAMPLING
METALS ANALYSES

Sample Location	SB-3	SB-6	SB-11
Sample Number	SSM-167	SSM-173	SSM-92
Sample Depth (ft)	12.0-13.5	7.5-9.0	0-1.5
Parameter (mg/kg)			
Arsenic	19	15	13
Barium	LD	45	202
Cadmium	LD	LD	4.8
Chromium (T)	LD	LD	LD
Lead	23	10	5.3
Mercury	LD	LD	LD
Selenium	LD	LD	LD
Silver	LD	LD	LD
% Solids	88	88	93

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 20

TANK FARM SOIL SAMPLING
EP TOXICITY ANALYSES

Sample Location	SB-3	SB-6	SB-11
Sample Number	SSM-167	SSM-173	SSM-92
Sample Depth (ft)	12.0-13.5	7.5-9.0	0-1.5
Parameter (mg/l)			
Arsenic	LD	LD	LD
Barium	LD	0.55	1.2
Cadmium	LD	LD	LD
Chromium (T)	LD	LD	LD
Lead	LD	LD	LD
Mercury	LD	LD	LD
Selenium	LD	LD	LD
Silver	LD	LD	LD

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.

APPENDIX D

CISTERN LIQUID, SEDIMENT AND SOIL BORING ANALYTICAL RESULTS

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 30

SAMPLING RESULTS
ORGANIC ANALYSES

Sample Location	Cistern	Cistern Inlet Pipe
Sample Number	CS-1	CS-6
Parameter (mg/l)		
Acetone	980.0	510.0
2-Butanone	360.0	440.0
Methylene Chloride	1300.0	300.0
Toluene	39.0 (J)	110.00
Xylene	LD	77.0
Butyl Acetate	LD	60.0
Ethyl Benzene	LD	16.0
4-Methyl, 2-Pentanone	LD	1100.0
Hexanone	LD	79.0
Mineral Spirits	SEE NOTE 3	
TOC	2760.0	--
TOX	23.0	--

NOTES:

1. LD indicates less than the detection limit.
2. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
3. Laboratory analysis identified floating oil layer on samples CS-1 and CS-6 as mineral spirits.
4. -- indicates parameter was not analyzed.

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BEDFORD, OHIO

TABLE 31

CISTERN LIQUID
METALS ANALYSES

Sample Number	CS-1
Parameter (mg/l)	
Arsenic	LD
Barium	0.120
Cadmium	LD
Chromium	0.048
Lead	LD
Mercury	0.6
Selenium	LD
Silver	LD

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 32

CISTERN RESIDUE
ORGANIC ANALYSES

Sample Number	CSS-1
Parameter (mg/kg)	
Acetone	9,300.0
Methyl Ethyl Ketone	8,000.0
1,1,1-Trichloroethane	34,000.0
Methylene Chloride	140,000.0
Trichloroethylene	8,100.0 (J)
Toluene	21,000.0
Xylene	22,000.0
Ethyl Benzene	4,500.0

NOTES:

1. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific compound refer to the laboratory reports in Appendix C.

2. J indicates compound identified at a concentration estimated below the detection limit.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 33

CISTERN RESIDUE
METALS ANALYSES

Sample Number	CSS-1
Parameter (mg/kg)	
Arsenic	17
Barium	4630
Cadmium	92
Chromium	3390
Lead	7130
Mercury	3.5
Selenium	LD
Silver	LD
% Solids	35

NOTES:

1. LD indicates less than the detection limit. Refer to Appendix C for the specific sample detection limit.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 34

CISTERN RESIDUE
EP TOXICITY ANALYSES

Sample Number	CSS-1
Parameter (mg/l)	
Arsenic	LD
Barium	0.490
Cadmium	0.300
Chromium	0.200
Lead	LD
Mercury	LD
Selenium	LD (R)
Silver	0.010

NOTES:

1. LD indicates less than the detection limit. Refer to Appendix C for the specific sample detection limit.
2. (R) indicates spike sample recovery was not within control limits.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 35

CISTERN BORINGS
ORGANIC ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4	SBC-5	SBC-6
Sample Number	SS-128	SS-133	SS-137	SS-144	SS-148	SS-152
Sample Depth (ft)	0.5-2.0	0.5-2.0	0.5-2.0	0.5-2.0	0.5-2.0	0.5-2.0
Parameter (mg/kg)						
Methylene Chloride	1.6	730	78 (J)	63	41	6.8
Acetone	23	LD	LD	240	160	LD
2-Butanone	10	LD	LD	320	130	9 (J)
1,1,1 Trichloroethane	2.4	LD	160	LD	LD	LD
4-Methyl-2 Pentanone	4.3	LD	LD	LD	19	LD
Tetrachloroethylene	15	LD	280	330	LD	9.9
Toluene	14	2600	1600	91	7.2	47
Chlorobenzene	18	LD	LD	LD	LD	LD
Ethyl Benzene	4.2	670	510	24 (J)	1.3 (J)	20
Xylene	19	2700	2000	130	6.6	120
Total VOCs	111.5	6700	4628	1198	365.1	212.7
OVA Readings (ppm)	GT 1000	GT 1000	GT 1000	GT 1000	GT 1000	GT 1000

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. GT indicates greater than.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 36

CISTERN BORINGS
ORGANIC ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4	SBC-5	SBC-6
Sample Number	SS-131	SS-135	SS-139	SS-146	SS-150	SS-154
Sample Depth (ft)	8.0-9.5	8.0-9.5	8.0-9.5	8.0-9.5	6.5-8.0	8.0-9.0
Parameter (mg/kg)						
Methylene Chloride	380	0.7	84	1.7	--	--
Acetone	1000	5.3	45	6.9	--	--
2-Butanone	1500	5.8	76	9.3	--	--
1,1,1 Trichloroethane	LD	LD	5	LD	--	--
4-Methyl-2 Pentanone	LD	LD	27	LD	--	--
Tetrachloroethylene	LD	LD	4.2	LD	--	--
Toluene	680	LD	41	1.5	--	--
Chlorobenzene	LD	LD	LD	LD	--	--
Ethyl Benzene	200 (J)	LD	13	0.29 (J)	--	--
Xylene	940	LD	47	1 (J)	--	--
Total VOCs	4700	11.8	342.2	20.69	--	--
OVA Readings (ppm)	GT 1000	900	--	850	320	400

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. -- indicates sample collected, but not submitted for laboratory analyses.
4. Sample number SS-135 was analyzed outside the 14 day holding time. Actual holding time was 16 days.
5. GT indicates greater than.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 37

CISTERN BORINGS
ORGANIC ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4	SBC-5	SBC-6	SBC-6
Sample Number	SS-132	SS-136	SS-140	SS-147	SS-151	SS-155	SS-155 RA
Sample Depth (ft)	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5
Parameter (mg/kg)							
Methylene Chloride	6.8	1.7	8.5	1.8	4.3	0.21	0.21
Acetone	16	7.8	32	3.2	12	0.14	0.11
2-Butanone	16	6.6	49	5.4	15	0.006(J)	LD
1,1,1 Trichloroethane	LD	LD	LD	LD	LD	0.043	0.037
4-Methyl-2 Pentanone	7.9	LD	11	3.2	2.8	LD	LD
Tetrachloroethylene	LD	LD	4.8	0.88	LD	0.041	0.042
Toluene	29	9.1	24	11.0	7.5	0.180	0.160
Chlorobenzene	LD	LD	LD	LD	LD	LD	LD
Ethyl Benzene	6	2.7	7.8	5.2	2.1	0.037	0.035
Xylene	27	13	32	23	8.7	0.180	0.190
Trans-1,2 Dichloroethylene	LD	LD	LD	LD	LD	0.008	LD
Trichloroethylene	LD	LD	LD	LD	LD	0.010	0.010 (J)
1,1,2-Trichloro -1,2,2-Trifluoroethane	LD	LD	LD	LD	LD	0.090 (J)	0.060 (J)
Trimethylsilanol	LD	LD	LD	LD	LD	LD	0.030 (J)
Total VOCs	108.7	40.9	169.1	53.68	52.4	0.945	0.884
OVA Readings (ppm)	GT 1000	GT 1000	--	GT 1000	340	140	--

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
2. (J) indicates compound identified at a concentration estimated below the detection limit.
3. Sample number SS-136 was analyzed outside the 14 day holding time. Actual holding time was 16 days.
4. The surrogate recoveries for sample number SS-155 were outside the QC limits due to matrix effects. Refer to the "Soil Surrogate Percent Recovery Summary" in Appendix C. Sample was reanalyzed SS-155RA.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 38

CISTERN BORINGS
ADDITIONAL SAMPLING DEPTHS
ORGANIC ANALYSIS

Sample Location	SBC-3	SBC-3	SBC-3
Sample Number	SS-138	SS-142	SS-143
Sample Depth	5.0-6.5	21.5-22.0	27.0-27.5
Parameter (mg/kg)			
Methylene Chloride	19 (J)	6.1	2.7
Acetone	100	38	16.
2-Butanone	46 (J)	22	22
4-Methyl-2-Pentanone	LD	LD	4.2
Toluene	120	3.4	2.3
Ethyl Benzene	43	1.0 (J)	0.82 (J)
Xylene	200	5.4	3.3
Total VOCs	528	75.9	51.32
OVA Reading (ppm)	GT 1000	100	GT 1000

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.

2. (J) indicates compound identified at a concentration estimated below the detection limit.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 39

CISTERN SOIL SAMPLING
METALS ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SS-128	SS-133	SS-137	SS-144
Sample Depth (ft)	0.5-2.0	0.5-2.0	0.5-2.0	0.5-2.0
Parameter (mg/kg)				
Arsenic	13	16	16	15
Barium	LD	LD	LD	LD
Cadmium	LD	LD	LD	LD
Chromium	LD	LD	LD	LD
Lead	5.3	7.8	10	15 (S)
Mercury	LD	LD	LD	LD
Selenium	LD	LD	LD	LD
Silver	LD	LD	LD	LD

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.

2. (S) indicates concentration determined by the method of standard addition.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 40

CISTERN SOIL SAMPLING
METALS ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-131	SSM-135	SSM-139	SSM-146
Sample Depth (ft)	8.0-9.5	8.0-9.5	8.0-9.5	8.0-9.5
Parameter (mg/kg)				
Arsenic	17	22	23	21
Barium	96	LD	76	LD
Cadmium	LD	LD	LD	4.1
Chromium	23	12	LD	18
Lead	70	12	21 (S)	15 (S)
Mercury	LD	LD	LD	LD
Selenium	LD	LD	LD	LD
Silver	LD	LD	LD	LD

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. Refer to Appendix C for the specific sample detection limit.

2. (S) indicates concentration determined by the method of standard addition.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 41

CISTERN SOIL SAMPLING
METALS ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-132	SSM-136	SSM-140	SSM-147
Sample Depth (ft)	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5
Parameter (mg/kg)				
Arsenic	18	29	19	17
Barium	LD	LD	LD	LD
Cadmium	LD	4.1	5.3	LD
Chromium	16	15	11	12
Lead	9.9 (S)	19 (S)	9 (S)	LD
Mercury	LD	LD	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	LD	LD	LD	LD

NOTES:

1. LD indicates less than the detection limit. Refer to Appendix C for the specific sample detection limit.

2. (S) indicates concentration determined by the method of standard addition.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 42

CISTERN SOIL SAMPLING
EP TOXICITY ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-128	SSM-133	SSM-137	SSM-144
Sample Depth (ft)	0.5-2.0	0.5-2.0	0.5-2.0	0.5-2.0
Parameter (mg/l)				
Arsenic	LD	LD	LD	LD
Barium	0.24	0.15	0.16	0.23
Cadmium	LD	LD	0.017	LD
Chromium (T)	LD	LD	LD	LD
Lead	LD	LD	LD	LD
Mercury	LD	LD	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	0.01	0.01	0.01	0.01

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.

2. (R) indicates spike sample recovery was not within control limits.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 43

CISTERN SOIL SAMPLING
EP TOXICITY ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-131	SSM-135	SSM-139	SSM-146
Sample Depth (ft)	8.0-9.5	8.0-9.5	8.0-9.5	8.0-9.5
Parameter (mg/l)				
Arsenic	LD	LD	LD	LD
Barium	0.6	LD	0.26	LD
Cadmium	0.011	LD	LD	LD
Chromium (T)	LD	LD	LD	LD
Lead	0.043	LD	LD	LD
Mercury	0.002	0.002	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	0.01	0.01	0.01	0.01

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.

2. (R) indicates spike sample recovery was not within control limits.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 44

CISTERN SOIL SAMPLING
EP TOXICITY ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-132	SSM-136	SSM-140	SSM-147
Sample Depth (ft)	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5
Parameter (mg/l)				
Arsenic	LD	LD	LD	LD
Barium	LD	LD	0.07	LD
Cadmium	LD	LD	LD	LD
Chromium (T)	LD	LD	LD	LD
Lead	LD	LD	LD	LD
Mercury	0.005	LD	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	0.01	0.01	0.01	0.01

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.

2. (R) indicates spike sample recovery was not within control limits.

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TABLE 45

CISTERN BORINGS
PERCHED WATER ORGANIC ANALYSES

Sample Location	SB-36	SB-36A	SB-37
Sample Number	SS-24	SS-27	SS-19
Sample Date	9/18/86	9/18/86	9/18/86
Parameter (mg/l)			
Acetone	220.0	230.0	LD
Methylene Chloride	380.0	460.0	LD
2-Butanone	430.0	420.0	LD
Toluene	24.0	25.0	160.0
Isopropyl Alcohol	LD	30.0 (J)	LD
4-Methyl, 2-Pentanone	36.0 (J)	31.0 (J)	LD
Hexanone	360.0	240.0	LD
Tetrahydrofuran	70.0 (J)(3)	LD	LD
TOC	42,000.	38,500	49.9
TOX	49.	68	0.300

NOTES:

1. LD indicates less than the detection limit.
2. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
3. Result includes the concentration of propyl furan.
4. -- indicates parameter was not analyzed.
5. J indicates compound identified at a concentration below the detection limit.

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BEDFORD, OHIO

TABLE 46

CISTERN BORINGS

Sample Location	SB-34	SB-35	SB-37	SB-38	SB-38
Sample Number	SS-17	SS-6	SS-22	SS-11	SS-13
Sample Depth (ft)	3.5-5.0	17.5-18.0	12-13.5	3.5-5.0	12.5-13.5
Parameter (mg/kg)					
Methylene Chloride	0.012	0.510	0.074	11 (J)	0.130
Acetone	0.210	0.130	0.230	LD	0.570
2-Butanone	0.013 (J)	0.041 (J)	0.016 (J)	LD	0.170
1,1,1 Trichloroethane	LD	0.110	LD	LD	0.015
Trichloroethylene	LD	0.110	LD	LD	LD
Benzene	LD	LD	LD	LD	0.013 (J)
4-Methyl-2 Pentanone	LD	0.026 (J)	LD	LD	0.069
Tetrachloroethylene	LD	0.600	LD	LD	0.026
Toluene	LD	0.100	LD	37	0.250
Ethyl Benzene	LD	0.043	LD	16 (J)	0.029
Total Xylenes	LD	0.250	LD	82	0.110
1,1,2-Trichloro 1,2,2-Trifluoroethane	LD	LD	0.7 (J)	LD	0.400 (J)
Propane, 2-2' Oxybis	LD	LD	LD	LD	0.020 (J)
Total VOCs	0.235	1.92	1.02	146	1.802
OVA Reading (ppm)	100	100	3.5	GT 1000	12

NOTES:

1. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.

2. (J) indicates compound identified at a concentration estimated below the detection limit.

APPENDIX E

HEALTH AND SAFETY PLAN FOR TANK FARM AND UNDERGROUND CISTERN CLOSURE

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I. Purpose

The purpose of this Health and Safety Plan (HASP) is to assign responsibilities, establish personnel protection standards, recommend operating procedures, and provide for contingencies that may arise during closure activities conducted at Hukill Chemical Corporation's (HCC) facility in Bedford, Ohio. The protocols in this HASP apply to all personnel involved in specific closure activities including employees of HCC and all outside contractors. These specific activities include: dewatering the cistern and plugging the inlet pipe; removing the earthen berm around the tank farm; excavating gravel to grade; removing perched water around the solvent tank farm sumps; and removing the solvent tank farm sumps.

This HASP was developed with the most recent and available information. If, through the closure activities, additional pertinent information to the safety of workers is made available, it will be used to amend this plan. In addition, the site manager may use this information to increase personnel protective measures on the study area site. All workers will be briefed on any amendments made to this plan.

II. Hazard Evaluation

Closure activities include placing a concrete cap over the existing tank farm area and backfilling the underground cistern. The soils beneath the tank farm and underground cistern are contaminated with solvents. There is a possibility that perched water around the sumps in the tank farm is also contaminated. These solvents when present in significant quantities may present a possible hazard of exposure by inhalation, skin contact and ingestion. Dusts which may be generated during gravel excavation and earthen dike removal may be contaminated with solvents and pose a potential hazard for skin absorption and incidental ingestion.

III. Responsibilities

There will be an on-site manager/safety officer present during the specific closure activities outlined in Section I of this HASP. This person is responsible for:

1. The implementation, enforcement and monitoring of the Site Health and Safety Plan.

2. The indoctrination of all personnel with regard to this safety plan other safety requirements to be observed during closure operations, including:

a. Potential hazards.
b. Personnel hygiene principles.
c. Personnel protective equipment.
d. Respiratory protective equipment usage and fit testing.
e. Emergency procedures dealing with fire and medical situations.

3. Maintenance and separation of the Exclusion, Decontamination and Support Zones and enforcing decontamination procedures.

4. Monitoring of hazards during closure operations.

5. Maintenance of log of (a) personnel closure area entry and exit times, (b) reason for entry, (c) description of activities performed by each individual, (d) problems encountered and actions taken, and (e) documentation of any chemical exposure symptoms to workers while on or after leaving the area.

6. Maintenance of closure area security by allowing only authorized individuals with proper training in the area.

IV. Closure Area Work Zones

In order to reduce the potential for contaminant migration and reduce the risk of personnel exposure to potentially hazardous substances, three zones will be established. The three zones are the: Exclusion Zone; Contamination Reduction Zone; and Support Zone. These zones are shown in Figure E-1.

The site manager will clearly lay out and identify the various closure area work zones. Limitations on equipment, operations and personnel in the three zones described below is the responsibility of the site manager.

A. Exclusion Zone

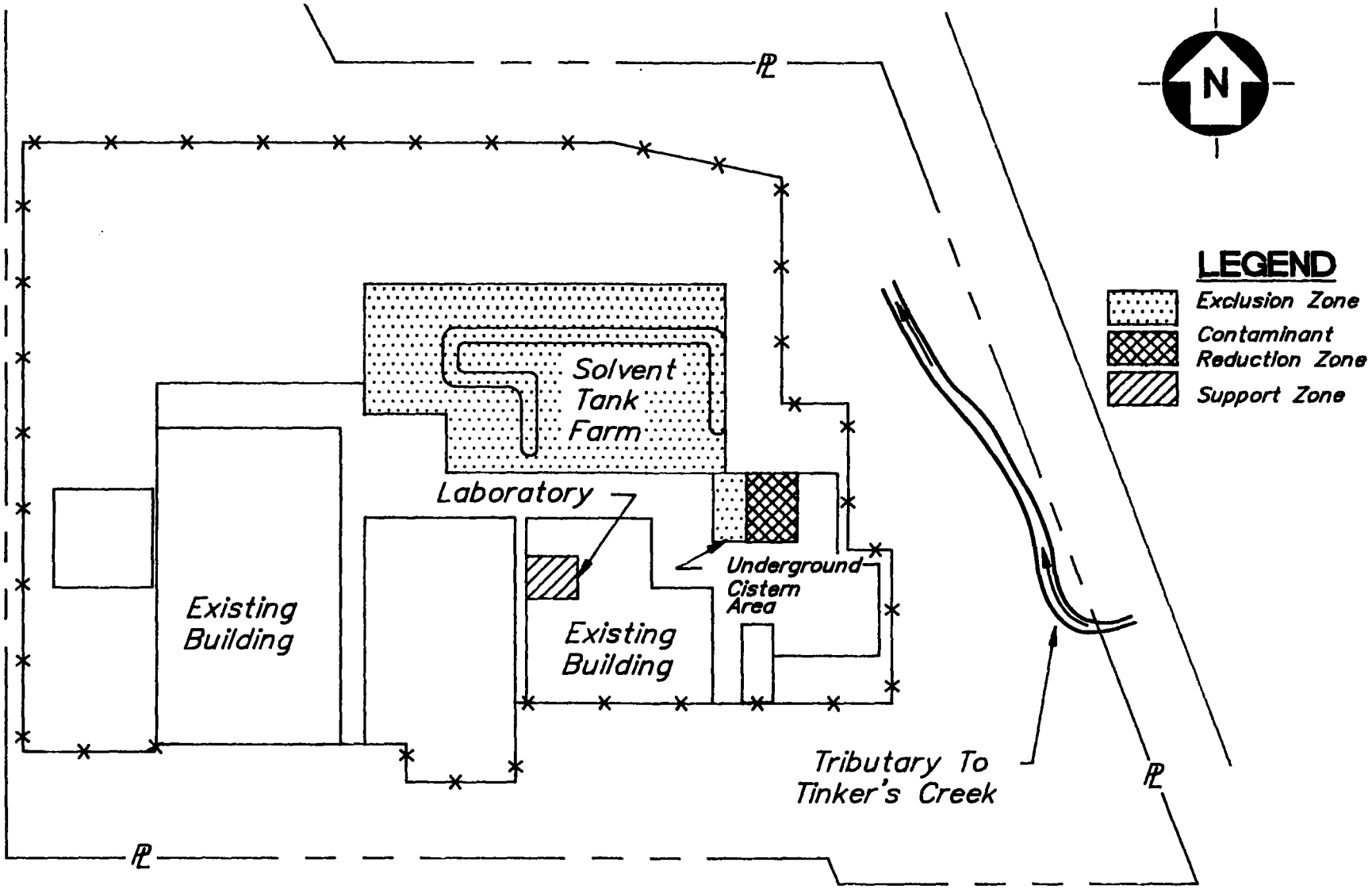
The Exclusion zone includes all areas where potentially contaminated soils, and perched water may be contacted. These areas will be clearly marked and personnel will be advised as to their location. Protection levels required in the Exclusion Zones are discussed in detail in Section VI of this HASP.

B. Contamination Reduction Zone

Contamination Reduction Zones are located contiguous and upwind of each Exclusion Zone. The Contamination Reduction Zone provides an area of decontamination for equipment, clothing and personnel prior to proceeding to the support Zone.

C. Support Zone

The Support Zone is the area outside the zone of significant contamination. An area inside the processing building at the HCC facility will serve as the support zone. The functions of the Support Zone include:



CLOSURE AREA WORK ZONES

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SK495-1D

FIGURE E-1

eder associates consulting engineers, p.c.

1. An entry area and checkpoint for personnel, materials and equipment for closure area site operations.

2. An area for decontaminated personnel, materials and equipment.

3. Storage area for equipment.

4. Housing for site special services.

5. Storage of first-aid supplies.

The support area office will be located either inside HCC laboratory or main plant building. Field office provisions for personnel will be provided, including a desk, phone and secured personal area for equipment. The support area office will contain a list of all authorized personnel.

V. Site Entry Procedures

All personnel working in the closure area will enter their names in the site log, which will be maintained in the Support Zone. Personnel will be escorted throughout the plant to the closure area and enter through a designated entry/checkpoint at the Contamination Reduction Zone. Before engaging in any site work, all personnel involved in such work will be briefed on the following:

1. The person in charge as site manager.

2. Boundries and exit and entry point locations of the closure area.

3. Decontamination procedures when required.

4. Chemical contaminants potentially in the area and their signs and symptoms of exposure.

5. Location of first-aid equipment and qualified personnel.

6. Procedures to be used in contacting emergency response personnel, including potential evacuation procedures to be pursued in case of emergencies

7. Location of emergency exit equipment.

8. Location of emergency evacuation meeting point.

9. Contractor staff person in charge.

10. Activities taking place that day.

11. Location of emergency eyewash and shower station.

12. Heat stress symptoms. All personnel will be advised to watch for signs of stress in staff working in Exclusion Zone.

VI. Personnel Protection

A. Levels of Protection

The level of protection generally be Level D. Level B protection will be required when plugging the inlet pipe to the cistern. Table 1 lists the required equipment for protection Levels B, C and D.

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TABLE 1

PROTECTION LEVELS

Level D Protection

1. Hardhat
2. Safety Glasses
3. Steel-toed Work Boots
4. Chemical Resistant Gloves

Level C Protection

1. Disposable Chemical Resistant Tyvek or Saranex Coverall with Hood
2. Inner Chemical Resistant Gloves
3. Outer Chemical Resistant Gloves
4. Steel-toed Work Boots
5. Boot Covers, Chemical Resistant (disposable)
6. Hardhat
7. Full-face, Air Purifying Respirator with Combination Particulate and Organic Vapor Canister (only NIOSH/MSHA approved equipment will be used. Canister shall be approved for use against: 1) organic vapors up to 1,000 ppm; and 2) dusts with a TWA of greater than 0.05 mg/m^3.

Level B Protection

Same as Level C Protection except:

1. A self-contained breathing apparatus (SCBA) is required instead of the air purifying respirator.

Levels of protection may be changed during site work on the basis on air quality monitoring as discussed in Section VIII of this HASP.

B. Surveillance Equipment and Materials

Before commencing the work described in the Plan at the HCC site, air quality samples will be monitored on the downwind sides of the tank farm area for organic vapors to establish background conditions. A discussion of the sampling procedures appears in the "Air Quality Monitoring Section" of this HASP.

During any work in the tank farm, air quality will be monitored for organic vapors using an organic vapor analyzer (OVA).

C. Medical Surveillance

In accordance with the USEPA's "Standard Operating Safety Guides" and OSHA CFR 29 Park 1910.120 (f), a yearly medical exam of the general state of health, baseline physiological data and ability to wear personnel protective equipment will be required for individuals engaged in on-site work activities. This site Health and Safety Plan addresses only emergency medical care and treatment.

D. Personnel Safety/Hygiene

The safety practices to be followed by all on-site personnel include:

1. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in the Exclusion or Contamination Reduction Zone.

2. Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking, or any other activities.

3. Whenever decontamination procedures for outer garments are in effect, it is recommended that the entire body should be thoroughly washed as soon as possible after the protective garment is removed.

4. No excessive facial hair, which interferes with a satisfactory fit of the mask-to-face seal, is allowed for personnel required to wear respiratory protective equipment.

5. Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, mud, and other discolored surfaces; kneel on ground, lean, sit or place equipment on drums, containers, vehicles, or the ground.

6. Medicine and alcohol can exaggerate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel where the potential for absorption, inhalation, or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverages will not be allowed during site operations.

Fluids will be provided to staff to replace perspiration and will be sealed in containers. All fluids for ingestion will be kept in the support area.

Due to the increase in ambient air temperatures and the effects of protective outer wear decreasing body ventilation, there exists an increase in the potential for injury, specifically heat casualties. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment

procedures, and the prevention of heat stress casualties. A Heat and Casualty Prevention Plan appears in Appendix E-1. It describes the identification and treatment for heat exhaustion and heat stroke, and lists the precautions to be taken in order to prevent heat stress at the HCC site.

The list of equipment that will be maintained on-site for use in the event of an emergency follows:

1. Emergency eye wash and shower.

2. Twenty pound ABC type dry chemical fire extinguishers.

3. Self-contained breathing apparatus for emergency use.

4. Emergency tools.

5. An industrial first-aid kit.

E. Personnel Training

All personnel will be trained in accordance with the OSHA requirements given in 40 CFR Part 1910.120(e) prior to working at this site. All on-site personnel directly involved in study activities will be briefed by the on-site manager/safety officer on levels of personnel protective equipment required for site study activities, safety and hygiene procedures, general cleanup procedures, symptoms of chemical exposure, heat/cold stress, study area entry and exit, and notification of emergency personnel. Periodic safety meetings will be held, as necessary, to inform these workers of changes in the safety plan and/or area conditions.

VII. Decontamination Procedures

Decontamination Procedures will be used when contact is made with the soil and perched water in the Exclusion Zones. All decontamination procedures will be performed in the Decontamination Zones. A Decontamination Station will be located contiguous to the Exclusion Zones. The list of procedures for personnel decontamination is provided below:

1. All boots and other contaminated garments which have come in contact with the soil will be cleaned with detergent and water in wash tubs. The wash water and residue will be collected and handled as hazardous waste.

2. All disposable garments will be removed at the Decontamination Station. The garments will be disposed of in bags or drums for later dispoosal at an approved site.

3. Spent cartridges/canisters from respiratory equipment will be disposed of in a bag or drum at the Decontamination Station.

4. Use a new set of inner gloves to clean equipment.

5. Dispose of any dirty trash in the drum provided at the Decontamination Station.

6. Depart the Decontamination Station and proceed to the Support Zone.

In addition to the procedures described above, all potentially contaminated equipment will be either steam cleaned and/or detergent washed on-site.

The decontamination equipment that will be contained at the site includes:

1. Water supply and detergent wash solutions for boot and equipment wash and rinse.

2. Trisodium phosphate.

3. Sheet Plastic.

4. Scrub brushes to clean garments and equipment.

VIII. Air Quality Monitoring

As described in Section VI-B of this HASP, air quality will be monitored at the tank farm for total organic vapors prior to conducting the site work in the tank farm. Sampling will be performed as listed below.

1. Organic vapors will be monitored using an organic vapor analyzer (OVA).

2. Background samples will be measured upwind and downwind of the tank farm area and in and around each well to be sampled prior to beginning work. Four samples will be measured in each area over an eight hour work day.

3. All measurements will be logged in a field notebook which will be provided.

4. Organic vapor monitoring will be conducted hourly during any work activities in the Exclusion Zone. Measurements will be taken at the downwind side of the Exclusion Zone.

5. When working in the Exclusion Zones at the site with Level D Protection, if total organic vapors exceed 10 ppm, workers will immediately move upwind of the work area and perform decontamination procedures. No one will re-enter the work area until air monitoring has been performed and the organic vapor concentration is less than 25 ppm or Level C Protection is used.

6. In the event that the total organic vapor concentration approaches 1,000 ppm, personnel working in the Exclusion Zones with Level C Protection will immediately leave the work area and perform appropriate decontamination procedures. Subsequent entry to the work area will only be allowed if the concentration fall below 1,000 ppm or Level B protection is used.

IX. Emergency Contingency Plan

A. Emergency Procedures

1. Emergency Exit Equipment will consist of self-contained breathing apparatus. They will be located in the Support Zone office.

2. Emergency fire fighting equipment, i.e., chemical extinguishers, will be maintained at the Support Zone office. In the event of a fire:

   a. A whistle will be sounded for site evacuation.

   b. The local fire department will be notified by the site manager.

   c. The chemical fire extinguishers will be employed to contain the fire, if possible.

3. Emergency evacuation of the site will occur in the event there is a fire or explosion. Workers will be signaled by a whistle, to be kept at the Support Zone office, indicating site evacuation. All workers will meet upwind of the site either at the office or on the adjacent property. The site manager is responsible to assure that all workers logged on to the site that day have been evacuated.

4. When working in the Exclusion Zones with Level D Protection, workers must move upwind of the work area, if total organic vapors exceed 10 ppm. No one may re-enter the work area unless organic vapors are less than 10 ppm or Level C Protection is used.

5. When working in the Exclusion Zones with Level C Protection, workers must move upwind of the work area, if total organic vapors exceed 1,000 ppm. No one may re-enter the work area unless organic vapors are less trhan 1,000 ppm or Level B Protection is used.

6. Emergency eye wash equipment will be maintained in the area adjacent to where work activities are occuring.

B. Local Resources

Fire Department, Bedford	232-1212
Police Department, Bedford	232-1234
Community Hospital of Bedford	439-2000
Poison Control Center	231-4455

C. Regulatory Contact

Ohio EPA Emergency Response	800-282-9378

D. Emergency Route to Community Hospital of Bedford

Beford Community hospital located at 44 Blaine Street, Bedford, Ohio is the nearest medical facility. It can be reached by taking Northfield Road north to Union Street. Make a left on Union Street (west) to Broadway. Make a left on Broadway (south) to Columbus Road. Make a right on Columbus Road (west) to Blaine Street. Make a left on Blaine Street (south) to Community Hospital.

The site manager will drive the route to the hospital before study area site activities take place.

E. Emergency Response Protocols

All emergency telephone numbers and an emergency route map to the hospital will be posted at the Support Zone office near the telephone. In the event of physical injury, the site safety officer or any other qualified person will initiate first-aid and, if necessary, call the ambulance. If the chemical exposure is encountered, a physician will be informed, as specifically as possible, of the chemical(s) to which the person has been exposed and the toxicological properties of the chemical(s). Closure area evacuation procedures and emergency response protocols will be reviewed with the site workers prior to closure area activities.

Also a schedule of work activities on the site will be provided to the fire personnel and hospital so they will know when activities are taking place. In addition, the hospital emergency personnel have been briefed on the nature of the contaminants in the study area and their health hazards. If any particularly hazardous activities will be occuring on the study area site at any time, the hospital and fire personnel will be notified.

APPENDIX E-I

HEAT AND STRESS CASUALTY PREVENTION PLAN

A. Identification and Treatment

1) Heat Exhaustion

a) Symptoms: Usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim is very pale, his skin is clammy, and he may perspire profusely. The pulse is weak and fast, his breathing is shallow. He may faint unless he lies down. This may pass, but sometimes it remains and death could occur.

b) First-Aid: Immediately remove the victim to the Decontamination Reduction Zone in a shady or cool area with good air circulation. Remove all protective outer wear. Call a physician. Treat the victim for shock. (Make him lie down, raise his feet 6-12 inches, and keep him warm but loosen all clothing.) If the victim is conscious, it may be helpful to give him sips of a salt water solution (1 teaspoon of salt to 1 gall of water). Transport victim to a medical facility.

2) Heat Stroke

a) Symptoms: This is the most serious of heat casualties due to the fact that the body excessively overheats. Body temperatures often are between 107°-110°F. First there is often pain in the head, dizziness, nausea, oppression, and a dryness of the skin and mouth. Unconsciousness follows quickly and death is imminent if exposure continues. The attack will usually occur suddenly.

b) First-Aid: Immediately evacuate the victim to a cool and shady area in the Decontamination Reduction Zone. Removal all protective outer wear and all personal clothing. Lay him on his back with the head and shoulders slightly elevated. It is imperative that the body temperature be lowered immediately. This can be accomplished by applying cold wet towels, ice bags, etc., to the head. Sponge off the bare skin with cool water or rubbing alcohol, if available, or even place him in a tub of cool water. The main objective is to cool him without chilling him. Give no stimulants. Transport the victim to a medical facility as soon as possible.

B. Prevention of Heat Stress

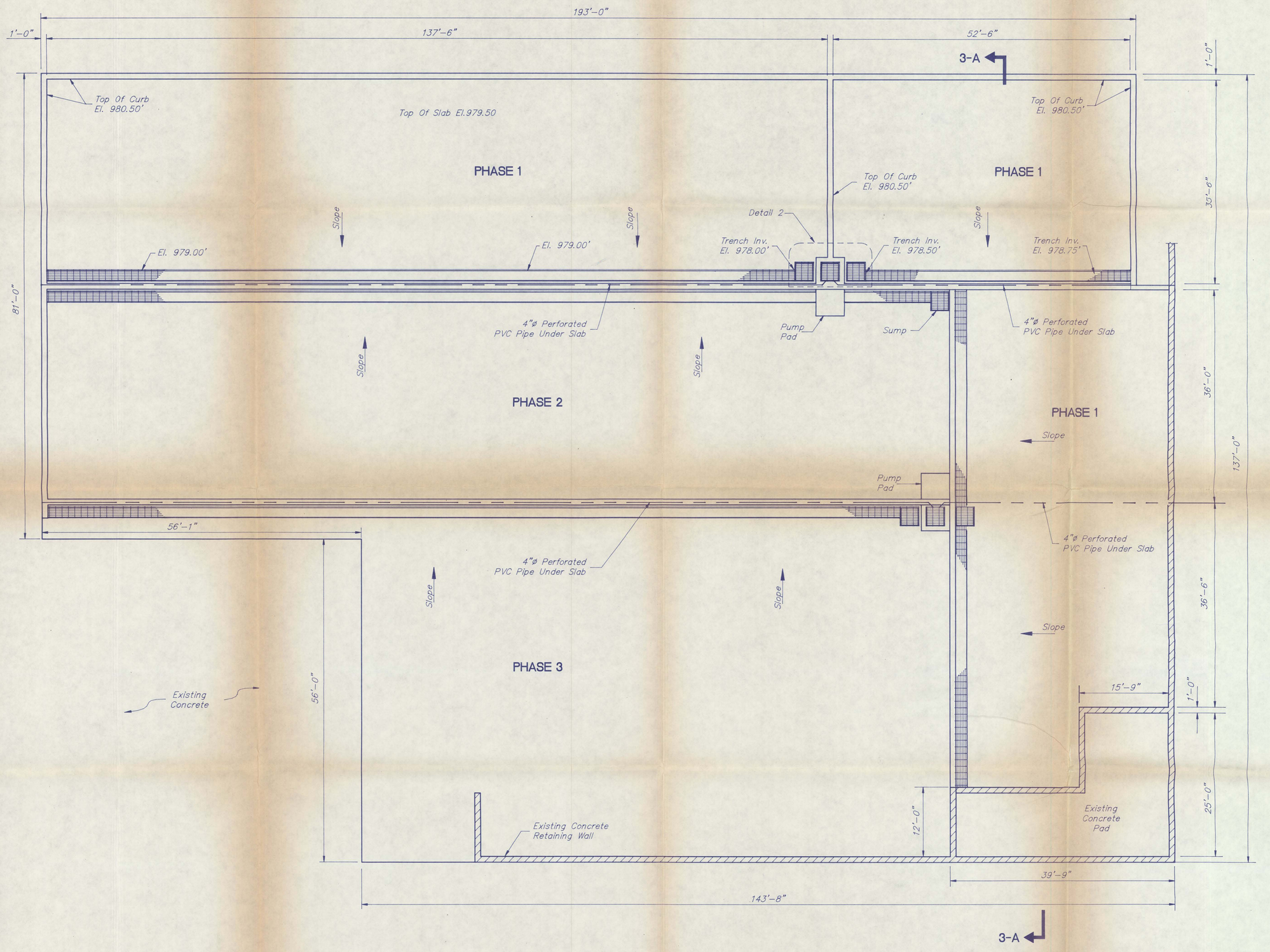
1) One of the major causes of heat casualties is the depletion of body fluids. On the site there will be plenty of fluids available. Personnel should replace water and salts loss from sweating. Salts can be replaced by either a 0.1% salt solution, more heavily salted foods, or commercial mixes such as Gatorade. The commercial mixes are advised for personnel on low sodium diets.

2) A work schedule will be established so that the majority of the work day will be during the morning hours of the day before ambient air temperature levels reach their highs.

3) A work/rest guideline will be implemented for personnel required to ear Level B protection, if this situation arises. This guideline is as follows:

Ambient Temperatures	Maximum Wearing Time
Above 90°F	1/2 hour
80°-90°F	1 hour
70°-80°F	2 hours
60°-70°F	3 hours
50°-60°F	4 hours
40°-50°F	5 hours
30°-40°F	6 hours
Below 30°F	8 hours

A sufficient period will be allowed for personnel to "cool down". This may require shifts of workers during operations.



No.	REVISIONS	DATE	BY

TANK FARM CLOSURE PLAN

HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

eder associates consulting engineers, p.c.
NEW YORK
MICHIGAN
WISCONSIN

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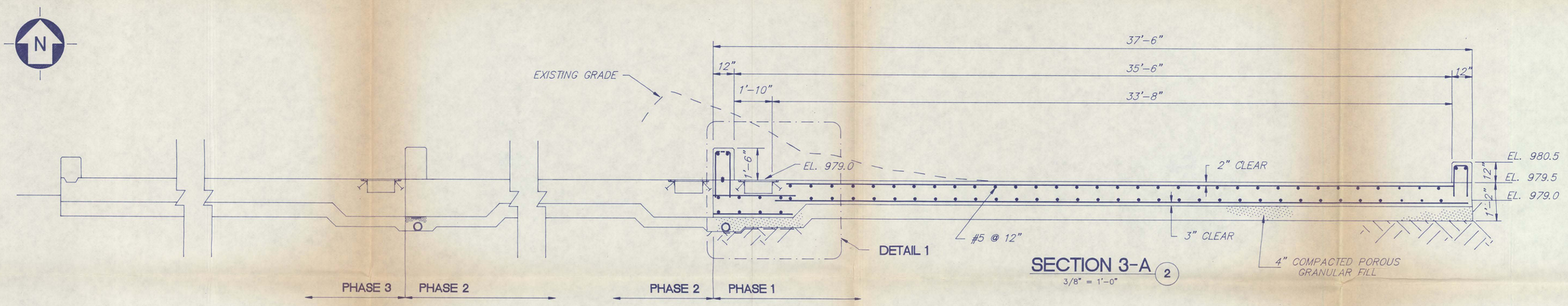
PROJECT
TANK FARM
CLOSURE PLAN
HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TITLE
CONCRETE CAP PLAN VIEW

eder associates consulting engineers, p.c.
LOCUST VALLEY, NEW YORK • MADISON, WISCONSIN
ANN ARBOR, MICHIGAN

DRAWN BY: MJD	SCALE: 1/8"=1'-0"
DESIGNED BY: SMH	PROJECT No.: 495-1
APPROVED BY: SMH, NAA	DWG. No.: 2
DATE: JANUARY, 1989	



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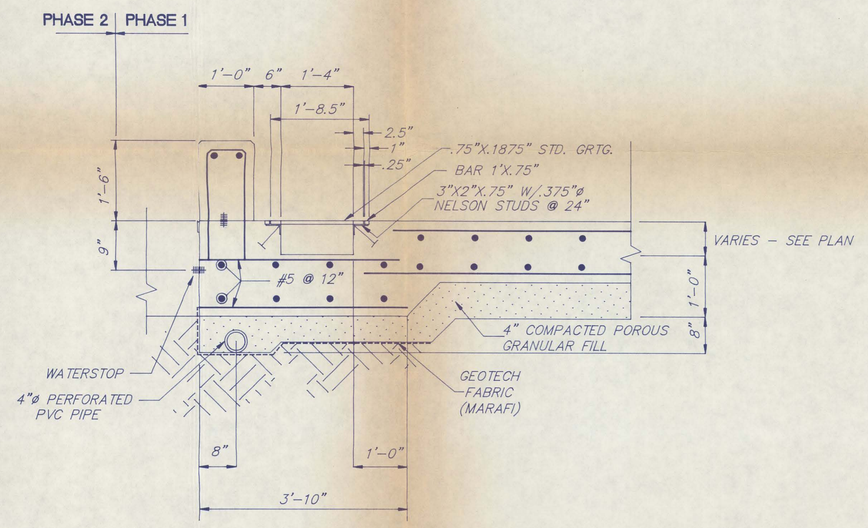

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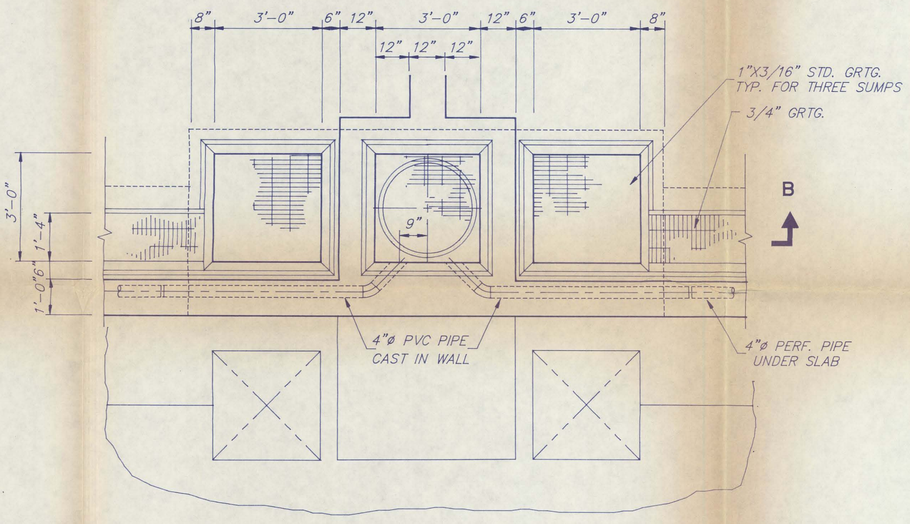

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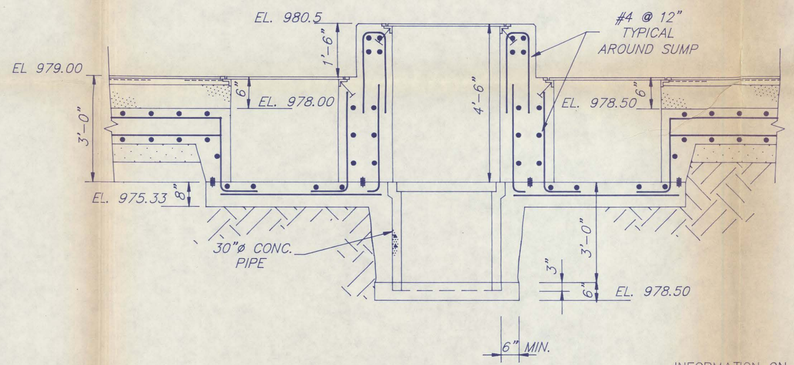

SECTION B-B

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TANK FARM CLOSURE PLAN

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PROJECT
TANK FARM
CLOSURE PLAN
HUKILL CHEMICAL CORPORATION
BEDFORD, OHIO

TITLE
SECTIONS AND DETAILS

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APPROVED BY SMH, NAA	DWG. No. 3
DATE DECEMBER, 1989	